1920.

Vol. XVIII. GOROKE CROP AND FALLOW COMPETITION. Part 3.

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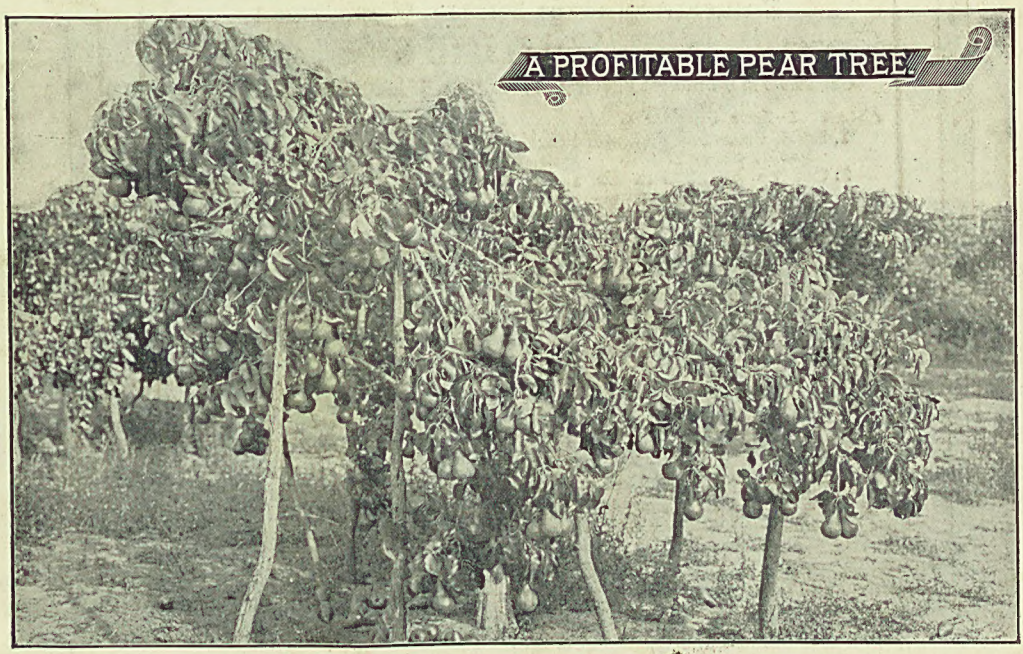
The Journal of the Department of Agriculture of Victoria, Australia.

March, 1920.



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OF

THE DEPARTMENT OF AGRICULTURE,

VICTORIA, AUSTRALIA.

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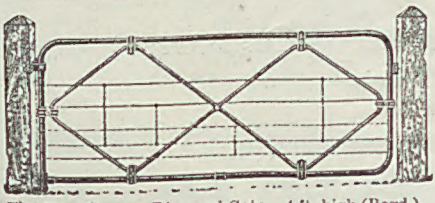

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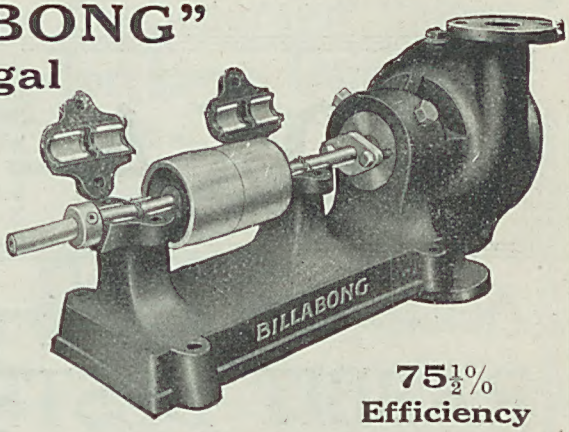

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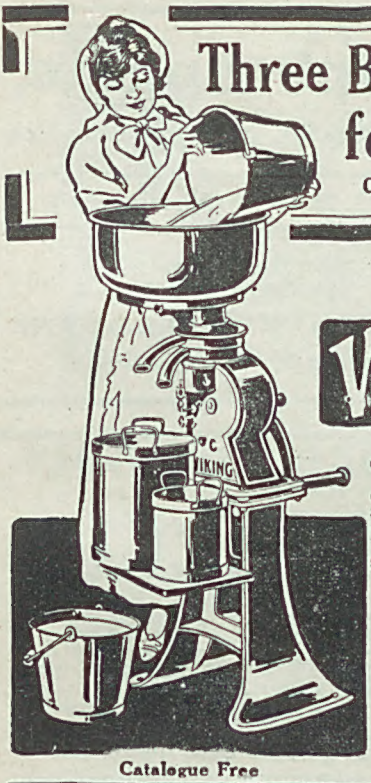

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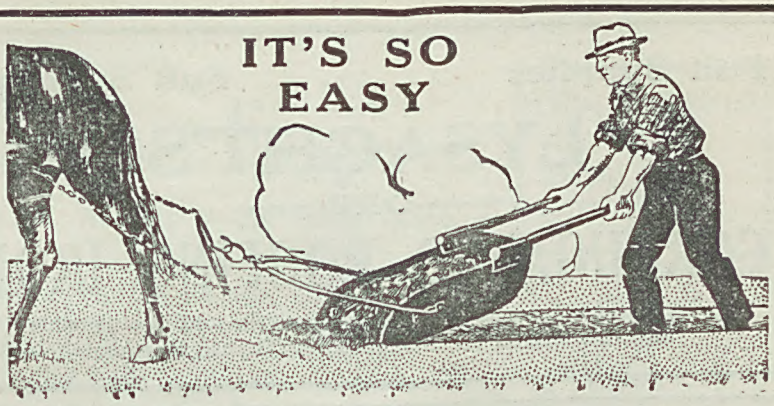

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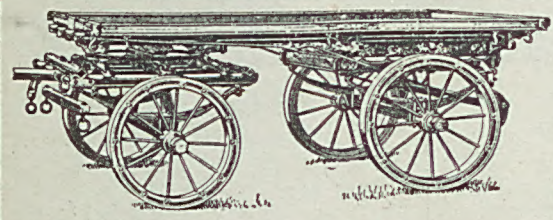

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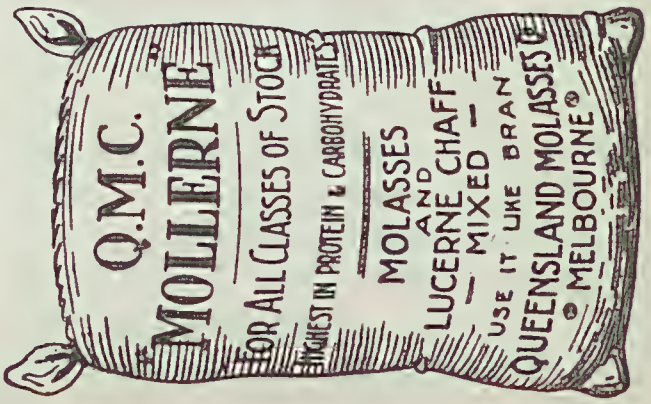

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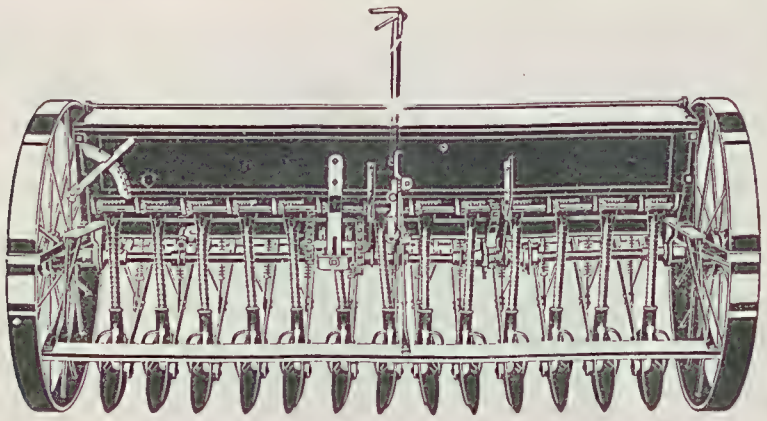

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Department of Agriculture

OF

VICTORIA.

Vol. XVIII. 15th March, 1920 Part 3.

GOROKE CROP AND FALLOW COMPETITIONS, 1919.

Report of the Judge, H. A. Mullett, B. Ag. Sc., Chief Field Officer, Department of Agriculture.

There is probably no district in the State where there has been less advancement in the methods of wheat production than in the Western Wimmera, of which Goroke is an important centre. Though the rainfall, averaging 20 inches annually, is adequate, the farming methods which have been developed in other districts are not applicable to Goroke without some modification. This is because the majority of the land is of a light character, which is readily set down by heavy winter rains after cultivation, and which then bakes hard in the sun. The remaining land, consisting of heavy "crab-holey" flats and rich sand hummocks near the lakes, does not present the same problems.

The raising of merino sheep on the natural pastures remains the staple industry, but some of the light soils, as well as large areas of the heavy land, are sown to wheat from time to time. On the light land it is found that fair crops of wheat can be grown with a minimum of cultivation; indeed, this method for light land is widely advocated in the district as the best way of raising a crop.

In a general way, however, wheat-growing has up to the present been a secondary consideration to the production of wool, and whenever the interests of the sheep and the wheat crop have clashed it is the latter that has generally suffered.

Under these conditions it would be indeed remarkable if wheat-growing practice had reached as high a standard at Goroke as in districts where wheat-growing is the main industry. It is this, together with the fact that the climatic and soil conditions differ materially from the rest of the wheat belt, that has induced the local agricultural society to conduct these annual Crop and Fallow Competitions, which have for their main object the promotion of investigations into local agricultural problems—especially wheat-growing and the quick spread of the

best farming practices when discovered—rather than the desire to promote mere rivalry for prizes.

The competitions have now been held for the third time, and already considerable information has been gleaned by a study on the spot of wheat crops and the methods by which they have been grown. In this way the most important local agricultural problems have now been resolved into a sufficiently concrete form to enable their definite investigation to be undertaken by means of local experimental plots.

These plots will shortly be initiated, and the following problems, which have been shown to be most important locally on the light land, will be investigated:—

1. Methods of cultivation.
2. Time of sowing wheat.
3. Manurial tests.
4. Improvement of temporary and permanent pastures.

Good type of bungalow of lime cement, recently erected by Mr. F. O. Robertson, of "Pleasant Banks," Goroke.

The Season.

The present season at Goroke has been very favorable for wheat-growing, because the winter precipitation, which is normally too heavy for the light soils, was much lighter than usual. The official rainfall record for the season shows that 19.15 inches were recorded, of which 6 inches fell outside the growing period of wheat. The rain which fell from April to November, inclusive, was, therefore 13 inches, *i.e.*, almost exactly the average rainfall for Horsham or Nhill over a similar period. Normally 16 inches fall in the wheat-growing period at Goroke.

Most of the crops were somewhat poorly stooled, but were, on the whole, remarkably well headed. Some exceedingly heavy crops of oats were seen on the clay land. Where precaution had not been taken to work the fallows after the heavy summer rains, weeds, particularly the rough sow thistle and the spear thistle, were noticeable in the crops, which, however, were generally free from wild oats.

Results.

Section I.—Best 50 Acres of Crop on Heavy Soil.

Name.	Variety.	Yield.	Trueness to Type.	Disease.	Weeds.	Evenness.	Total.
Possible Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
J. Delaney	Federation ..	30	15	13	12	11	81
S. Cross	Yandilla King ..	26	15	13	13	13	80
J. C. McPhee ..	Federation ..	29	11	8	14	13	75
A. Richards	Federation ..	21	16	13	12	12	74
J. E. Molloy	Federation ..	24	16	8	11	9	68
A. & J. Cumming ..	Federation ..	21	15	12	12	9	67
A. J. Lees	Penny ..	15	17	12	13	8	65

Mr. Delaney's Winning Crop of Federation Wheat on Heavy Soil. Sown on well-worked fallow, 1st May, 60 lbs. seed, 100 lbs. super.

Mr. Delaney's crop of Federation was grown on heavy crab-holey ground, which received in all five cultural operations before sowing. The land was ploughed early with a mouldboard plough and spring-toothed; it was disc-cultivated in the spring to kill weeds and conserve moisture; after harvest it was springtoothed in February after rain, and again just before sowing. The crop was put in with the combined spring-tooth cultivator drill during the first week in May; 60 lbs. of seed were used and 100 lbs. superphosphate, and it was fed off to sheep. It was thick and very nicely headed, though it was patchy in the crab-holes. There was a fair number of strangers present, as was the case with most of the crops seen. The cultivation that this paddock received, particularly the working after the summer rain, and the relatively early sowing, were the main factors responsible for the heavy yield.

Mr. Cross's crop was sown on a rich black flat, which has been well levelled by cultivation. The crop was very tall and regular, though somewhat thin and late. Mr. Cross stated that it was sown with 90 lbs. of a new brand of phosphatic manure, but that where superphosphate was used the crop was markedly heavier. This was the case on a number of farms in the district when the manure was tested alongside super-phosphate under equivalent conditions.

Mr. J. C. McPhee's crop of Federation was mainly grown on a fertile loamy bank of a lake. It was very clean and well headed. Stinking smut was, however, present, as was the case with the crop shown by Mr. Molloy. Mr. Lee's crop was sown on stubble land.

Section II.—Best 50 Acres of Crop on Light Soil.

Name.	Variety.	Yield.	Trueness to Type.	Disease.	Weeds.	Evenness.	Total.
Possible Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
Caldow Bros. ..	Federation .. College Purple Straw	22	18	14	14	12	80
C. D. Block	Federation ..	19	19	10	14	13	75
F. O. Robertson ..	Federation ..	23	15	12	13	11	74
A. J. Hawkins ..	Major Federation Penny ..	16	17	12	15	12	72

Heavy bank of College Purple Straw Wheat in Messrs. Caldow Brothers' Winning Crop—Light Section. Fallow left rough, crop sown April, 60 lbs. seed, 100 lbs. super.

Messrs. Caldow Brothers' crop was grown on fallow, which was merely ploughed at the end of August and left in the rough until scarified in the following April. The sowing took place at the end of April with 60 lbs. of seed and 100 lbs. of superphosphate. The paddock was harrowed after the drill, and was fed off with sheep.

The whole of the ground upon which this crop was grown was a shade heavier than the average light land, and the heaviest crop was grown on a rich loamy bank. The crop was very free from strangers and wild oats, and was in every way commendable.

Mr. Block's land was ploughed in August, spring-toothed at the end of September, and harrowed and left until it was re-worked with the spring-tooth the following May, when the sowing took place, 60 lbs. of seed and 112 lbs. of superphosphate being used. This crop was the purest of any seen in the district.

Mr. Robertson's crop was well headed, though somewhat on the thin side. It was probably the heaviest of all the crops shown on light soil. It had received the maximum of cultivation, and was grown on what practically constituted a summer fallow. The land was disc-ploughed in March; subsequently it was springtoothed and then disc-cultivated in the spring. After harvest it was springtoothed after the February rain. The paddock was sown towards the end of April with 60 lbs. of wheat and 100 lbs. of superphosphate, the combined springtooth cultivator-drill being used. The paddock was harrowed after drilling, and fed off to sheep. The crop probably would have benefited considerably by harrowing after the grazing had that been practicable.

Section III.—Best 50 Acres of Crop Grown on 1918 Fallow.

(Points for crop and fallow added together.)

Heavy Soil.

Name.	Variety.	Yield.	Trueness to Type.	Disease.	Weeds.	Evenness.	Total 1919 crop.	Total for 1918 Fallow.	Grand Total.
Possible Points ..	.. .. ..	35	20	15	15	15	100	100	200
S. Cross	Yandilla King ..	26	15	13	13	13	80	77	157
J. Delaney	Federation ..	30	15	13	12	11	81	75	156
H. G. Burns.. ..	Federation ..	18	14	12	10	10	64	83	147
J. Cumming.. ..	Federation ..	23	15	10	10	10	68	65	133
J. Molloy	Federation ..	15	13	8	8	5	46	74	110

The exhibits of Messrs. Delaney and Cross were the same as those described under Section I. Mr. Burns' crop was on September-ploughed fallow, which was springtoothed in October. After harvest it was harrowed in March, and was subsequently springtoothed just before seeding in the last week in May. 56 lbs. of wheat was used and 72 lbs. of superphosphate.

The crop was somewhat patchy owing to crab-holes, and had blighted off badly on the limey banks. An interesting illustration of the value of "super" on this class of land was afforded in this paddock where the drill had failed to apply the manure. There was about four bags to the acre difference in the yields of the manured and unmanured portion.

Section IV.—Best 50 Acres of Crop Grown on 1918 Fallow—Light Soil.

(Points for crop and fallow added together.)

Light Soil.

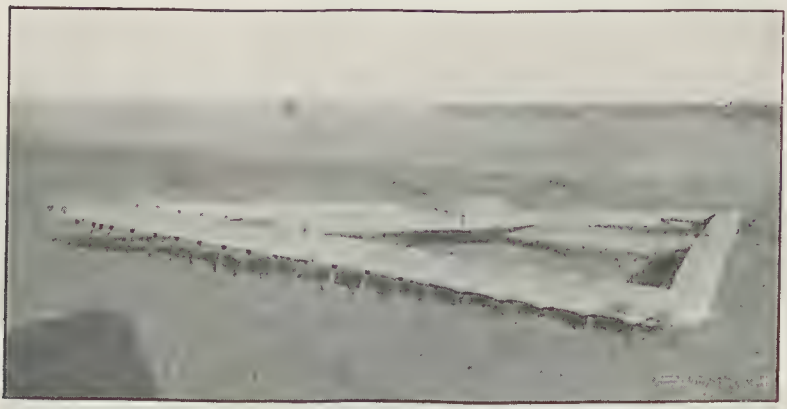
Name.	Variety.	Yield.	Purity and Trueness to Type.	Disease.	Weeds.	Evenness.	Total.	Total for 1918 Fallow.	Grand Total.
Possible Points	.. .. ..	35	20	15	15	15	100	100	200
Jas. Lowe	Federation ..	22	15	12	13	12	74	77	151
F. O. Robertson ..	Federation ..	22	15	13	13	11	74	73	147
C. D. Block	Federation ..	19	19	10	14	13	75	61	136
Caldow Bros. ..	College Purple Straw ..	23	18	14	14	11	80	44	124

The crops shown by Messrs. Caldow Bros. and Mr. Block were the same as those exhibited under Section II. The fallow on which the winning crop was grown was ploughed in September, springtoothed in November, and diseed the following April, prior to the seeding which took place in mid-April. One and a quarter bushels of seed were sown with 112 lbs. superphosphate. The crop was fed off to sheep.

Mr. Robertson's crop received similar treatment to that given to his crop entered in Section II., except that it was sown a couple of weeks later and the seed had not been pickled.

Crops on the Heavy Soils.

At Goroke there are large though patchy areas of rich black soils. Where carefully farmed they are capable of growing heavy crops of wheat. Most paddocks are studded with large crab-holes, which render their management difficult, and result each year in serious loss of wheat owing too water logging.



Type of Land Grader used by Mr. Lees, of Maryvale Station, for levelling "crab-holey" country. Each side of the triangle measures 15 feet.

Cultivating implements assist in dragging portion of the fertile banks into the holes, but where the minimum of working is giving as at Goroke, it is a slow process.

In my earlier reports I have advocated the systematic use of the home-made grader for the purpose. It could be cheaply and effectively employed once or twice each season in place of the usual harrowing. Mr. A. J. Lees has constructed an implement of this type which is doing most satisfactory work. It consists of three heavy pieces of timber each 15 feet long, and bolted in the shape of a triangle. Along each beam heavy iron spikes have been driven at intervals of 6 inches. These project a similar distance into the soil. The implement really acts as a set of very heavy rigid harrows, and when six horses are attached to one corner, a drayload or so of earth can be pulled into each crab-hole passed over. It is economical to work, covering a 15-foot span, but is somewhat cumbersome to transport.

These soils when knocked into shape will pay for the most thorough cultivation, the object of which is threefold. A seed bed with a firm

bottom is required for wheat, the land must be freed of weeds by encouraging the germination of the weeds so that they may be killed by grazing and cultivation before they have seeded, and moisture must be conserved by the formation of a blanket of 2½ to 3 inches of fine mellow loose surface soil. On these soils the best Wimmera practice should be applicable when the weeds, such as spear thistles, &c., will permit it.

The Goroke country is eminently suited for the growing of oats. Portion of a very heavy crop of Algerian oats grown by Mr. Lees, of Maryvale Station, on fallow which was left in the rough till seed time.

Another view of Mr. Lees' heavy crop of Algerian oats.

The ploughing should be done as early as possible with a mouldboard plough from 4 to 4½ inches deep. The land should then be harrowed with heavy harrows. The object is to get a reasonably fine seed bed which will germinate as much of the weeds as possible in the spring, when they can be grazed to sheep, and subsequently the paddock may be recultivated, preferably with a tine scarifier, but with a disc or broad

foot cultivating scarifier if the weeds are too bad. This cultivation should not be deeper than 3 inches and never to the depth of the original ploughing. One objection to using heavy implements like the one-way disc and the cultivating plough for this work is that it is often difficult to keep them at a uniform depth.

Harrowing or springtoothing should then take place with the object of producing a fine mellow surface soil. This having been accomplished, cultivation with the harrows or springtooth should be carried on throughout the summer and autumn each time half-inch or so of rain falls. Just prior to seed time the weeds will again make their appearance, when the paddock can be rescarified or disced, and then harrowed or springtoothed and drilled. I believe it would pay to summer fallow the more friable paddocks of this black land. A description of summer fallowing was included in the report of the Nhill Farm Competition for this year. (See *Journal of Agriculture*, January, 1920.)

The winning crop in this section had been reasonably well worked—especially had the operations been given at the most seasonable time—a most important factor in securing the necessary tilth. In working fallows after rain too great a time should not be allowed to elapse before commencing the operation. Dry working should be avoided. I do not think that the necessity for early sowing is so important on this class of soil when once the crab-holes have been levelled, as it is on the light land. On the Wimmera plains it is found that, if sowing is deferred until after the first good rains, much cleaner and heavier crops can be grown. The reason is that the rain helps in the consolidation of the soil, and particularly in germinating wild oats and other rubbish.

Where the land has been well tilled, and the sowing is taking place from mid-May to the first of June, the best of Wimmera farmers are finding 1¼ bushels of seeds and 112 lbs. of superphosphates the most profitable. Penny wheat, which has a fairly large grain and starts somewhat slowly, certainly requires to be sown at the heavier rate.

At Goroke the crops are usually thin and dirty, the heavier seeding should therefore be an undoubted advantage.

Several of the crops were smutted. This can be avoided by careful pickling. A full account on the pickling of wheat appears in the report of both the Dimboola and the Nhill Crop and Fallow Competitions. (See *Journal of Agriculture* for January and February of this year.) The seed wheat is becoming increasing full of strangers, and will shortly require to be renewed.

Crops on the Light Soil.

One of the most debated points at Goroke is the best method of cultivating the fallows. Some aver that no working whatever is necessary, and that the fallow is better left in the sod throughout the summer—but others contend that it should be given thorough spring and autumn cultivation. Of course it should be understood that the majority of the light land farmed is new land, and therefore troublesome weeds do not make their appearance for the first few years. It must be admitted that during the past two years—so far as one can judge—there has been little to choose between the two systems.

The heaviest crop this year was grown on well worked land, though the difference between that and the next crop which received the

minimum of treatment was not very great. Last year a crop receiving this latter treatment won the "light" section of the competition.

The number of crops examined are too few and too widely separated, however, to allow of a sound deduction being made, and the final test can well be left to the experimental plots.

In my report of last year I suggested that probably the time of sowing would be a specially important factor in determining wheat yields on these light soils.

The crops sown from mid-April to early May, as advocated, have during the past two years yielded quite a couple of bags to the acre more than crops sown later on. This year the two leading crops were sown at the end of April.

As on the light soils, I believe it would pay to increase the weight of seed sown to the acre, because of the poor germination and stooling shown by most of the crops.

Goroke soils show exceptional response to the use of superphosphate. 90 lbs. of super. is about the average dressing throughout the district. Where the drill accidentally failed to drop the manure, marked differences were seen last year. The view shown above was taken in Mr. Robertson's oat crop.

The most profitable amount of superphosphate to apply has never been determined for Goroke soils. The average amount used is about 90 lbs. The soils appear to be notoriously deficient in phosphates, and fertilizers could probably be increased with safety. The benefit of the heavy dressings to the herbage which comes when the land is spelled is notable.

In view of the fact that the light land is easily set down by the winter rains, and that most of the crops are regularly fed off to sheep, it should pay handsomely to harrow each paddock thoroughly after the sheep have been removed.

Increasing the Carrying Capacity.

Goroke has some fine flocks of Merino sheep, and at present much of the cultivation has for its ultimate object the provision of increased feed for the sheep—feed in the young growing crop, in the stubbles, and in the increased growth of grass, trefoil, wild oats, and rubbish which establish themselves when the paddock is rested.

Well informed land-owners are not slow to take advantage of the extra profits that accrue in this way, and they mostly allow fresh portions of their holdings to be cultivated from time to time on the share system. They will find it profitable to stipulate that heavy dressings of superphosphates be applied with the wheat, and liberal cultivation given on the black soils. The bulk and quality of the herbage is improved by cultivation and manuring on both classes of soil, and on the crab-holey land the cultivation in addition gradually tends to level it.

The more frequent the cultivation, the more effective the levelling.

There is no good reason why it should not pay to take much more definite steps to cheaply increase the sheep feed than those quoted, especially in view of the present high level of wool prices.

In the Western Wimmera there are large areas covered with "Black Grass" (*Lepidosperma lineare*). This sedge is practically useless as sheep feed. The illustration shows how it may be entirely eradicated by the growth of a crop or two of wheat or oats. When the land is spelled useful native grasses re-establish themselves as a result of cultivation and manure.

There are two general methods by which the improvement might cheaply be made: they have been referred to in previous reports. The first is the sowing of some plant with the last cereal crop prior to spelling the land, and the second is the application of superphosphate directly to the grass land.

The King Island meliot is a plant which can be cheaply purchased, and which should do well for a year or two if sown with the wheat at the rate of ½ lb. or so to the acre just prior to letting the paddock out. There is no doubt that the plant would do well on the heavy soils just as it does on the black soils of the Wimmera. The Wimmera rye grass is another plant which is worth testing, though if the land is required again for wheat this grass should be introduced with some caution. A full

account of this plant and the habits is given in the *Journal of Agriculture* for March, 1919. Messrs. Caldow Brothers sowed some at the rate of 1½ lb. to the acre with their wheat on a poor paddock which is about to be spelled, and the growth of the grass has been remarkable. The area sown was 150 acres in extent, and the behaviour of the grass during the next few years will be well worth watching by those interested. Judging by its performance in other districts, it should readily establish itself, but will require cultivating with a scarifier or disc every four or five years. As supplies of the seed of the true Wimmera rye grass are almost unobtainable this year owing to the grass being fed off

Messrs. Caldow Bros. sowed 1½ lbs. of Wimmera Rye Grass per acre with 150 acres of wheat on land intended to be spelled. The sample of rye grass shown is a representative one.

to stock, those desirous of testing the grass for themselves should obtain their seed if possible from this stand.

. . . . . .

In conclusion, I have again to thank the President, Mr. F. O. Robertson, and others who provided the necessary transport, even though it necessitated stopping urgent operations in the field, and also those who extended the hospitality of their homes during the judging week. The farms visited are not as easy of access as in most other districts, and I would like to publicly commend the Secretary, Mr. David A. Vorwerg, to whose constant care and supervision the carrying out of the week's programme to a successful completion was due.

AGRICULTURE IN DENMARK.

By R. T. McKenzie, Dairy Supervisor.

While in England waiting for repatriation, the A.I.F. Education Service arranged a tour of a party through Denmark for the purpose of studying the methods adopted in the production of agricultural products, the co-operative methods involved in their manufacture and preparation for oversea markets. The writer had the privilege of being a member of the party, and some observations made during the visit may be of interest.

The unique position held by Denmark in the agricultural world is familiar to all.

Possessing no metalliferous undertakings, she has been compelled to exploit her soil, with such success that the history of Danish agriculture during the last 50 years reads like a fairy tale.

Denmark is not favoured with any great natural advantages; in fact, careful observation indicates that the soil is not rich, while the breeds of live stock, tillage methods and farming technique are no better than was seen in other European countries.

The reason for the success that characterizes the developments of Danish agriculture is primarily due to the wonderful system of co-operation. Up till the year 1860 farming in Denmark differed little from that of other European counttries, and was a combination of meat and corn production.

For economic reasons, the Dane turned his attention to dairy farming, and his foresight was justified, for when the cheaply-produced grain and other agricultural products from America and Australia flooded the Old World markets, almost every country in Europe suffered a considerable set-back. Denmark, on the other hand, not only maintained her position, but became established as one of the great dairying countries of the world. That this combination of producers has been instrumental in cheapening the cost of production in the improvement of the finished article, in the elimination of the middleman, in increasing the return to the farmer, and in improving the lot of the farm hand, can hardly be questioned. The organization of producers is now very complete, and owes its strength to the fact that the peasant farmer realizes that in combination with his fellows for mutual aid, he is in a much better position than if he had to bargain for himself.

While co-operation is mainly responsible for the success of Danish agriculture, other considerations, such as land tenure, educational facilities, social conditions, and small holdings, have played an important part. Denmark is essentially a country of small holdings, 80 per cent. of the farms containing less than 150 acres. Out of a total of 250,000 farms, only 800 are over 500 acres, and the tendency for many years has been for a reduction in size. The tenant system of occupancy is rare, 90 per cent. of the farms being freehold.

Formerly, the organization of the social life of the Danish peasant was such that many civic duties were performed in common, and the community of interest thus inculcated formed a firm foundation for the subsequent development of the modern co-operative enterprise.

The Dairying Industry.

The Rural High Schools, and facilities for acquiring scientific agricultural knowledge, cannot be overlooked as a factor in the success of the movement. The first co-operative creamery in Denmark was founded in 1875 by several farmers, at Kaslunde, on the Island of Funen. Although fairly successful, it was not until the success that attended the establishment of the Hieding Co-operative Creamery, in 1882, that a fillip was given to the movement, which soon spread its ramifications throughout Denmark, and revolutionized dairy practice.

Through the instrumentality of the co-operative creameries, it was possible for the dairy farmer, no matter on what scale he dairied, even if only one cow were milked, to obtain the very highest price for his product. Moreover, it made possible the manufacture of a uniform quality of butter, and so make a reputation on the English market. We visited several of these creameries. There is nothing about the architecture worth mentioning. With the exception of the widespread use of the pasteurizer, the plants are similar to our own. The law provides that all cream intended for the manufacture of export butter must be pasteurized. The regenerative principle is utilized, that is, the incoming cold milk is used to cool down the milk that has already been heated to the high degree of 185 degrees F.; at the same time, the cold milk on its onward course is heated correspondingly.

The Danes claim, and experience would seem to justify the claim, that the only way of eliminating bad flavours and getting a uniform quality of butter is by pasteurization. Under another legal enactment, surprise butter exhibitions are held weekly. The butter is called up by wire, the water content determined, and the product judged by a committee consisting of nine judges, viz., 6 merchants, 2 dairy managers, and 1 consulting expert. In the provinces, exhibitions are held periodically, and judged similarly, but in these instances the factory is made aware when the butter will be called in.

Special dairy schools are in existence for training managers in all the intricacies of dairy science. It is almost impossible to obtain a position in a butter factory without the diploma of one of these institutions. The butter is put up in casks containing 100 lbs., which bear the "Lur Brand" trade mark. This is a compulsory mark for all butter intended for export, and no inferior butter is allowed to leave the country. The bulk of Danish butter is exported to England, practically the whole of it being sent direct to the retailers. It is not only produced co-operatively, but sold through co-operative channels. It may be said truly that no other butter-producing country sells its product to consumers in another country at so small an advance on the original price received by the farmer. The writer visited Tooley-street market several times in London, and saw butter from many countries pass through the hands of agents, but not a solitary cask of Danish butter. Very little milk is separated on the farm, and that is, no doubt, a factor in the production of a high-class butter. All skim milk, according to law, must be heated to a temperature of 176 degrees F., before being returned to the farmer. The danger of spreading tuberculosis is minimized greatly in this way. There are over 1,200 co-operative creameries in Denmark, having a turnover of about £21,000,000.

The Cattle.

The chief breeds of cattle number four, viz., Black and White Jutland, Red Danish, Shorthorn, and Jersey. The two former are native breeds, and the two latter imported. The Black and White Jutlands are found in the north of Jutland, and are regarded as dual purpose cows. The characteristics of the breed are its black and white or grey or fawn colour, a big frame, with capacious belly, udder well developed fore and aft, wide between the hips, hide soft, and hair fine; a vigorous cow, always in good condition. The milking capacity, of course, depends on the family, individual, and breed. In a good herd, the mature cow would average about 7,000 lbs. of milk, with a fat test of 3.2. The Red Danish is found in the south-east of Jutland, and the Islands of Lolland, Langeland, and Funen; in fact, the majority of the cows belong to this famous breed. They are of the dairy type, and of a beautiful red colour, with a harmonious frame, udder well developed, and splendid teats. They possess to a large degree the power of transmitting to the progeny their milking propensity. The Red Danish is more productive than the black and white breed for dairying, but not so good for beef.

The Shorthorn is, of course, well known, and in some districts of Jutland has a high reputation as an animal of quick growth, of good beef qualities, and a good milker. Jersey cattle are scattered all over Denmark. They have made great headway during recent years, and one well known stock expert ventured the opinion that the Jersey, in a few years, would be the principal dairy animal in that country.

The high productiveness of Danish cows is recognised the whole world over. That reputation has been achieved through the agency of two very ingenious co-operative undertakings initiated some few years ago—The Cow Testing Association and Bull Clubs.

Herd Improvement.

The object of the Cow Testing Association is to let the farmer know the amount of milk and butter each cow produces, so that he can discard the unprofitable members of his herd, and use the best cows for breeding purposes. The Dane, while recognising the importance of the various points indicating milking qualities, requires more exact knowledge as to the milking capacity of the cows. The Original Control Society, as they are called, was established in 1895 at Vejen, Jutland. When the first report of the operations of the society was made available by Mr. Jens Johansen, it startled the whole dairying community. The report stated, *inter alia,* that while with the best cow it cost 6d. to produce 1 lb. of butter, in the case of the poorest it cost 2s. 8d. An example was given of two cows that stood side by side in the shed, both getting exactly the same feed, care, and attention. No. 1 gave 7,810 lbs. of milk, with a butter fat test of 4.26, equalling 385 lbs. of butter; No. 2 gave 8,226 lbs. of milk, with a test of 2.93, producing 280 lbs. of butter. Although No. 2 gave 416 lbs. more milk, No. 1, with her higher test, yielded 105 lbs. more butter. Such a revelation caused the movement to spread, and to-day there are about 700 Cow Testing Associations, with a total of 16,500 members, owning 225,000 cows. Some of the more advanced societies also keep records of the amount of food consumed by each cow. The following figures show the increase in the

average yearly yield of butter-fat per cow between the years 1854 and 1918:—

1854 at 44 lbs.
1861 at 68 lbs.
1871 at 96 lbs.
1898 at 129 lbs.
1903 at 173 lbs.
1914 at 215 lbs.
1918 at 240 lbs.

As might be supposed, the greatest increase has taken place since the initiation of the Control Societies; and, according to the latest figures available, the average yield per cow is 240 lbs. The Australian average is estimated at about 150 lbs., so we have a long way to go to reach the Danish figures.

Mr. Lars Frederiksen, one of Denmark's foremost stock experts, gave some information about the work of these associations. The work of the society is done by a Control Assistant, who is specially trained for his duties at one of the Agricultural High Schools. The tester visits the farm, identifies the cows, weighs the milk yielded during 24 hours by each cow, tests a composite sample for butter-fat content, and enters the figures in a record book, in which a page is set apart for each cow. This is done fortnightly. The tester, also, during his visit, marks any calves born since his previous visit, notes the date of birth, sex, also the names of sire and dam.

Reports of the year's working are furnished, and dealt with in this way:—In the first place, all cows that have produced 385 lbs. of butter are picked out; secondly, if they had a herd-book bull as a sire, a card is filled out as a record. This is considered very important, so that information may be available as to which of the herd-book bulls give the best offspring as far as milk and fat production is concerned. It is found that there is a great variation in value of bulls as sires—the offspring of some bulls give less milk and butter than the mothers did. Mr. Frederiksen gave an example of such a bull with a negative breeding value. A bull, herd-book No. 1529, had eleven daughters tested on an average; the eleven daughters, after their first calving, produced 5,291 lbs. of milk, 3.42 test, and 180 lbs. of butter-fat. The dams of those young cows, after their first calving, produced 6.017 lbs. of milk, of 3.75 test, and 225 lbs. of butter-fat. In other words, the offspring produced, after their first calving, 726 lbs. of milk, of 0.33 test, and 45 lbs. of butter-fat less than their dams did. On the other hand, a bull named "Emb. Britten," had eighteen daughters, the average production of which in six years was 6.809 lbs. of milk, 3.71 test, and 281 lbs. of butter-fat. The dams of these eighteen cows in six years averaged 6,140 lbs. of milk, 3.36 test, and 206 lbs. of butter-fat This means that the bull "Emb. Britten" increased the production of his daughters by 75 lbs. of butter-fat per year; whereas herd-book No. 1529 had decreased the yield of his daughters by 45 lbs. per year.

The Bull Clubs and Control Societies work hand in hand, their aim being the improvement and development of dairy cattle by purchasing bulls of a recognised breeding strain, and running them with the best cows. In this way, the improvement of dairy cattle, instead of being restricted to the big breeders who can afford to buy the best

sires, is shared by the smallest farmer, who has his cows served by the very best bulls available through the Bull Club. In 1918, there was 950 such clubs, owning 1,050 bulls, with 25,000 members, in possession of 250,000 cows. No bull belonging to the dairy type can get a prize at a Danish show unless his dam's record is known. In the show catalogue, the female ancestors' records are furnished, and the bulls judged from three different stand-points, viz.:—(1) The animal itself. (2) The records of his female ancestors. (3) The pedigree. In some classes the bull is judged on his progeny.

Feeding.

Every care is taken that the cows are well and economically fed. When grazing, they are tethered and given limited radii in which to graze, and the picket pegs frequently shifted. The large amount of roots fed to cows in Denmark is surprising; in fact, they form the bulk of the ration in hand feeding. A typical winter ration for a cow producing 25 lbs. of milk or over is 5 lbs. of oil cake, 2½ lbs. of hay, and 80 lbs. of roots.

The Pig Industry.

This is a very important industry. There are about 50 Co-operative Bacon Factories, which slaughter 2,000,000 pigs yearly.

The chief breed is the Danish Native White, a fast-growing pig, with a long-snouted head, drooping ears, fairly long neck, somewhat light in the shoulders, long flat body, and good hams. They are very prolific, and good mothers, having an average litter of about eleven. The large Yorkshire is also prominent, and is used largely for crossing in order to produce a bacon suitable for the English market. Breeding "Centres" for the purpose of improving the swine have been established throughout Denmark. We visited the one at Langeskar. The object of the "Centres" is to test pigs as regards their thriftiness, fattening propensity, and quality of bacon, and if up to standard on these points to record them in the herd-book. The *modus operandi* is as follows:—A farmer wishing to have his pigs entered in the herd-book is visited by a committee appointed by the United Co-operative Bacon Factories, which inspects the pigs proposed for entry. This committee judges the pigs' fitness, type, and general appearance. If considered satisfactory, four of their progeny are sent to the breeding "Centre." Here they are fed in separate sties. All food given is weighed, and each animal's weight registered fortnightly, and its progress noted. The standard demanded is that a pig should grow to about 200 lbs. weight in from six to seven months, after consuming about 700 "food units." The expression "food unit" is a Scandinavian term, and represents 1 lb. of grain or its equivalent, 6 lbs. of skim milk, 12 lbs. of roots or 7 lbs. of green lucerne, and ¾ lb. of various oil cakes.

If the progress of the selected pigs and the quality of the bacon after slaughtering is deemed satisfactory, a second or confirmatory test is made from a second litter of the same parents. If the results are still satisfactory on the passing of this double test, the parents are eligible for entry into the herd-book.

The whole scheme is very economically worked. The manager of the "Centre," who is usually a farmer himself, pays one-half the market

value for the young pigs, and gets the full proceeds from the factory after slaughter. This compensates him for the work and care involved. It may be pointed out, incidentally, that Australia has contributed very materially to the success of the Danish pig industry, as a large proportion of the offal from our wheat milled in England is exported to Denmark, and furnishes pig-farmers there with cheap concentrated food.

The Poultry Industry.

This has developed enormously during recent years. Egg production is the main object. The Danish Co-operative Export Society is responsible for the great reform in collecting and marking of eggs which has given the product such a good name on the English market. The society was formed in 1895 by a village schoolmaster, Mr. F. Möller. It now has branches all over the country.

The eggs are brought by the producer to the "Circle"—which is really a receiving depôt—to which he belongs. Each "Circle" and its members have distinctive numbers. The collector marks the eggs with a rubber stamp bearing the identifying number of the member and the "Circle" to which he belongs, so that in the event of a defective egg being delivered the sender can at once be identified. Under the by-laws of the local "Circle," every member is bound to deliver all fresh eggs, except those used in the household for domestic purposes. The eggs must be collected daily from the nests, and sent at least once a week to the "Circle," members being liable to a fine if eggs older than seven days are delivered. Aggravated offences are met by expulsion.

From the local "Circles," the eggs are forwarded to the export centres, where they are graded into five groups, viz.:—14, 15, 16, 17, and 18 lbs. respectively to the long hundred (120). They are tested for soundness and freshness. Each egg is hall-marked with the Society's brand. They are then packed in cases containing twelve long hundreds (1,440).

In 1895, the first year of the operation of the Society, the turnover was 95 tons; in 1915 it had increased to 4,660 tons. In 1895 the export of eggs from Denmark to the United Kingdom was valued at £385,000. Twenty years later, the value had increased to £4,000,000, and in this period prices rose from 8½d. to 1s. per dozen. The turning point of the egg industry, which ranks fourth highest among agricultural products, synchronizes with the establishment of the Co-operative Society.

Beet Sugar.

The growing of sugar beet is a thriving industry. The area devoted to its culture in 1888 was 18,000 acres; in 1901, it was 37,000 acres; and in 1918, it had increased to 80,000 acres. Eight hundred and thirty thousand tons of beet were grown last year, and produced, approximately 150,000 tons of sugar. The Maribo Sugar Factory, which we visited, has a ten years' contract with the growers, paying about 25s. per ton for roots. Fifty per cent. of the profits is distributed amongst the growers apart from any amounts they receive as shareholders. During the war, the contract conditions were altered, and as high as 50s. per ton was paid for beet. The "pulp" is returned to suppliers for use as a cattle food, and is highly esteemed by the dairyman, special pits being constructed for its storage. The lime precipitate used during the clarifying process is applied for ameliorating the soil.

The company runs narrow-gauge railways through the district for carrying the beet to the factory, and appoints supervisors at various places to instruct the farmers in the most approved methods of culture. Experiment plots have been established for raising a beet with a high sugar content. An average crop is about 12 tons to tthe acre, yielding about 2 tons of sugar. Most of the work in the fields is done by Polish women.

The State Seed Testing Station.

One of the most interesting institutions visited was the State Seed Testing Station, the oldest and largest of its kind in the world. It is situated close to Copenhagen. The Director, Professor Dorph-Petersen, described the work of tthe institution when showing us round. He stated that investigations made in 1871 into the miserable conditions of Danish pastures disclosed the fact that it was the poor quality of seed sown that was largely responsible. Samples of clover and grass seeds taken from farms in different localities showed only 25 per cent. of pure seed able to germinate. In other words, for every 4 lbs. of seed purchased, results were obtained as from 1 lb. of pure seed, the bulk consisting largely of rubbish in the shape of chaff, sterile seed, and seeds of other plants. The outcome was the establishment of the Station, and results have justified its existence, not only to the farmer in protecting him from the sale of valueless seed, but to the seed-growers and honest seed merchants as well. The activities of the Station include investigations of the purity, germinating power, and weight of grain, as well as its water content and place of origin. In the determination for purity, an average sample of at least 1,000 seeds is taken. The sample is spread over a glass plate, and carefully examined with a scalpel and magnifying glass. During the process of examination, the sample is divided into four groups, viz.:—Pure seed, waste matter, seed of extraneous cultivated plants, and weed seeds. To the first group belongs all pure seed, no matter at what stage of development; the second group includes dirt, injured seed, pieces of plants, in fact all dead matter; the third group is made up of seeds of all plants other than the one under examination; and the fourth obviously includes all the seeds of weeds.

In the test for germination, the seed is placed on an apparatus made for the purpose. Both power and speed of germination are noted and indicated on the analysis chart. The object of determining the water content of seed is to ascertain if it contains more than the normal amount of water, as such seed must not be stored in bags for any length of time in a temperature exceeding 50 per cent. F., otherwise the germinating power will deteriorate. The test is made by heating a sample for about five hours at a temperature of 212 degrees F. to evaporate the moisture, and the residue is then weighed. The place of origin is generally determined by "character" seeds found in the samples which are peculiar to certain districts and countries. To calculate the amount of the pure seed able to germinate, the figures for purity and germinating power are multiplied and divided by 100. For instance, if a sample contains 90 per cent. pure seed, and has a germinating power of 80 per cent., the result is 72 per cent. of pure seed able to germinate.

The State Seed Testing Station has an agreement with the controlled dealers, who bind themselves to submit to the Station the name of all home purchasers of certain seeds at the time the seed is sold. From

these purchasers the Station selects addresses, and a request is made to furnish a sample. Samples are also taken from the seller. If the result of an analysis is not in accordance with the guarantee of the seed merchant, redress is demanded. Seventeen of the co-operative societies and private seed merchants, who handle two-thirds of the seed used in Denmark, submitted to the supervision of the Station in 1918-19. It is safe to say there is no other country in the world where such care is exercised in the control of seed used by the farmer, and this attention has been largely instrumental in the success of seed culture in Denmark. In 1907, 10,000 acres were devoted to raising grass seed, seeds of various legumes, and seeds of the cabbage family. In 1912, it had increased to 29,000 acres, and in 1918 to 65,000 acres. A considerable amount of seed is grown for seed merchants on the share system. The merchant supplies the pure seed, which the farmer undertakes to grow under the most up-to-date methods of culture, and to supply the yield to the merchant only. Another condition of this share system is sometimes the growing in isolation of crops subject to cross-fertilization Twenty per cent. of seed after the harvest goes to the seed merchant, and he has the option of the balance at market rates. One big seed firm visited had 200 growers supplying seed under these conditions.

Waste Lands.

A striking feature of Danish industry was seen in the reclammation of moorland or heath country in North-west Jutland. In the war with Germany in 1866, about one-third of the Danish territory was seized. The Dane, therefore, had to turn his attention to utilizing what had been considered waste land. The problem of reclaiming the moors had been attempted before in many other European countries, but the task had been given up as hopeless.

Denmark, after the loss of her rich provinces, however, was forced to make another attempt to make the heather-covered moors profitable. A Society was formed, known as the Danish Heath Society, led by Captain Dalgas, and the problem tackled with great energy. We were driven through many thousands of acres which, less than 50 years ago, were a desolate waste, but which to-day are planted with great pine forests, with here and there homesteads surrounded by green fields, having every appearance of prosperity. The work of the Society is subsidized by State and private subscriptions. It divides itself into several sections, pine forests, arable land, meadows, and peatmaking. The procedure adopted in reclaiming the land varies slightly according to whether it is peaty or sandy. Generally it consists of draining, and burning the heather. The land is then ploughed and left exposed to weather conditions for some time. It is then ploughed again, and dressed heavily with marl, 2 tons to the acre usually, 100 lbs. of 37 per cent. kainite, and 100 lbs. of 18 per cent. super. It is sown with a trial crop of oats and peas, and after harvesting, the land is not ploughed but harrowed and sown down with pasture grasses. A top-dressing of artificial fertilizer is given annually. Since the Society started operations in 1866, the area of moorland turned to profitable account exceeds 1,000,000 acres. While it may be inaccurate to say that at present there are no waste lands in Denmark, it can be said that in another generation, with the same progress as that of the last thirty years, there will be not a foot of land that is not put to its most productive use.

Agronomy.

The agronomic conditions are influenced by the fact that practically the chief aim in the cultivation of the soil is in producing forage crops for feeding purposes. Lucerne is grown largely. All cropping is centred in the idea of keeping the soil in a fertile state. A typical rotation extends over eight years, and is as follows:—Wheat or rye, root crop, barley, root crop, oats and vetches, barley, clover and grasses.

Farmyard manure plays a large part in soil fertility, and is called by the Danes their gold mine. It is stored either in heaps or sheds. Liquid manure is considered very valuable, and is collected and stored in tanks. A spreader, similar to a water-cart, is used for its application to the land. Marl is in great demand, and a lot of money is spent by the State in developing deposits. There are two large Co-operative Marling Societies, which last year supplied to their members 1,000,000 cubic yards.

Agricultural Education.

This is given great prominence. People's High Schools, Agricultural Colleges, Schools of Domestic Economy, are scattered throughout the land.

Very little practical training is given at any of these institutions; that is left to private resource. Some of the farmers, of course, get practical training on the farm; in other cases, boys are apprenticed for three years to well-known farmers. The Government grants a subsidy to apprentices engaged in draining, irrigation, crop growing, and animal husbandry. The schools are chiefly located in the country districts; most of them are run as private ventures subsidized by the State, according to the number of pupils. A characteristic feature of the Danish social policy is to combine private and State effort. The initiative is taken by the individual, and if deemed worthy, State assistance will be given. This is exemplified to a large degree in the education system. The Ladelund Dairy School, famous for the work of some of its old pupils, is owned by a limited company. The directors are elected by the shareholders, and with three teachers, appointed from the staff, are responsible for the management. The courses, which are short, are held in the winter months. The curriculum includes instructions in dairy practice, chemistry, dairy bacteriology, animal husbandry, and the work of "Control Assistant." A feature of the school is the agricultural and dairy museum, where the evolution of the most primitive appliances to the most modern can be seen.

Agricultural councillors are appointed, who travel in the rural districts to advise in plant culture, dairying, animal husbandry, plant diseases, forestry, &c. There are about 100 such officers. Lectures by these experts are always well attended. The Dane not only does things, but he wants to know why he does them. An example was noticed one day when a queue of farmers were waiting admission to the already overcrowded hall to hear a lecture by one of the experts. Rather a contrast to our own country, where the farmer seems very loath to take advantage of the facilities at his disposal, due, no doubt, to psychological and temperamental differences. And it is this spirit of inquiry, with a capacity for taking trouble, that has led to the intense development of Denmark, until to-day she is able, though only half the size of Tasmania, to support a population of 3,000,000.

PEAR GROWING IN VICTORIA.

By E. Wallis, Orchard Supervisor.

Ensuring the Crop—Cross Fertilization.

(Continued from page 93.)

If profitable crops of pears are to be consistently produced, the orchardist must plant varieties which mutually influence each other in the vital process of fertilization, for if this be not accomplished crop failure is bound to result.

It is an established fact that some varieties are very prone to self-sterility, and in fact varieties which may usually be classed as self-fertile are in some instances in need of cross-fertilization in order to enable them to set their crops.

Therefore in order to guard against the risk of varieties not proving self-fertilizing, it is well at the outset to inter-plant varieties which it is known will cross, or which, at any rate, are of nearly simultaneous blooming habit, thus minimizing the risk of crop failure.

Many of the orchards planted during the last decade have been arranged on these lines, and the beneficial results are already noticeable in them. Varieties, which under the old system of planting without due regard to interpollination failed to set profitable crops of pears, are now found under the new order of planting to yield remarkably well.

The Kieffer variety is perhaps the most noted self-sterile variety grown in this State, and up till ten years ago it was quite common to find large areas planted with this pear, which, although the trees were ten or fifteen years old, had never yielded any profitable quantity of fruit. In fact, many trees in the Diamond Creek and other fruit-growing districts had absolutely failed to bear crops.

In consequence of this unsatisfactory condition of things the matter was taken in hand in the season 1910-11, when acting under instructions from the present Chief Orchard Supervisor, Mr. P. J. Carmody, the writer, with the assistance of the other orchard supervisors stationed throughout the State, compiled a list of the blooming times of fruits. This list, with other data concerning experiments and observations relating to sterility in fruit trees, was published in the *Journal of Agriculture,* January, 1911.

In the experiments referred to, Kieffer, on account of its proneness to sterility in fruiting, was selected for the purpose of experiment by cross-fertilization at the orchards of Messrs. W. G. Gray, G. Middleton, and C. Millthorpe, in the Diamond Creek district. The varieties used for crossing with the Kieffer were Beurre d'Anjou, Harrington's Victoria, Howell, and Le Conte, small limbs of bloom of these varieties being placed in the centres of Kieffer trees in vessels containing water, whilst in some cases hand fertilizing of the Kieffer blooms was adopted.

The results were quite remarkable, for the trees treated responded by setting a heavy crop of pears, especially those in near proximity to the introduced blossoms, or where hand fertilizing had been done, each of the varieties mentioned proving equally effective as a cross. One grower stated, "The Kieffer pears set like grapes where the other blossoms were put in the trees."

Plate No. 48 shows one of the Kieffer trees treated in these experiments, and Plate No. 49 a section of same. It will be seen that this

tree has set a heavy crop which, although about ten years old at the time, had not previously borne any appreciable amount of fruit, in fact had been almost a total failure.

Plate No. 50 shows the adjoining tree of same variety which failed almost entirely to set its crop during the season in which the experiments were conducted.

Profiting by the result of these experiments, growers in whose orchards these profitless patches of trees existed cut some of the trees

Plate No. 48.—Kieffer Pear Tree, 10 years old, bearing first crop of fruit as a result of cross-fertilization.

back, and worked them over with one of the several varieties mentioned so as to provide the necessary crossing medium. In some cases twigs on the affected trees were grafted in the same way, but this did not prove as effective as the other method. Plate No. 51 shows a young Kieffer tree treated by the latter method, the pieces of white calico tied round indicating where grafts were made.

By the mistakes made in past plantings, and through the consequent observations and experiments to remedy these mistakes, the prospective pear-grower is now able to so arrange the trees in his orchard that the beneficial effect from cross-fertilization may be obtained.

Causes of Sterility in Pear Trees.

The cause of self-sterility in pear trees in a general sense is due to the impotency of the pollen of one particular variety upon its own pistils.

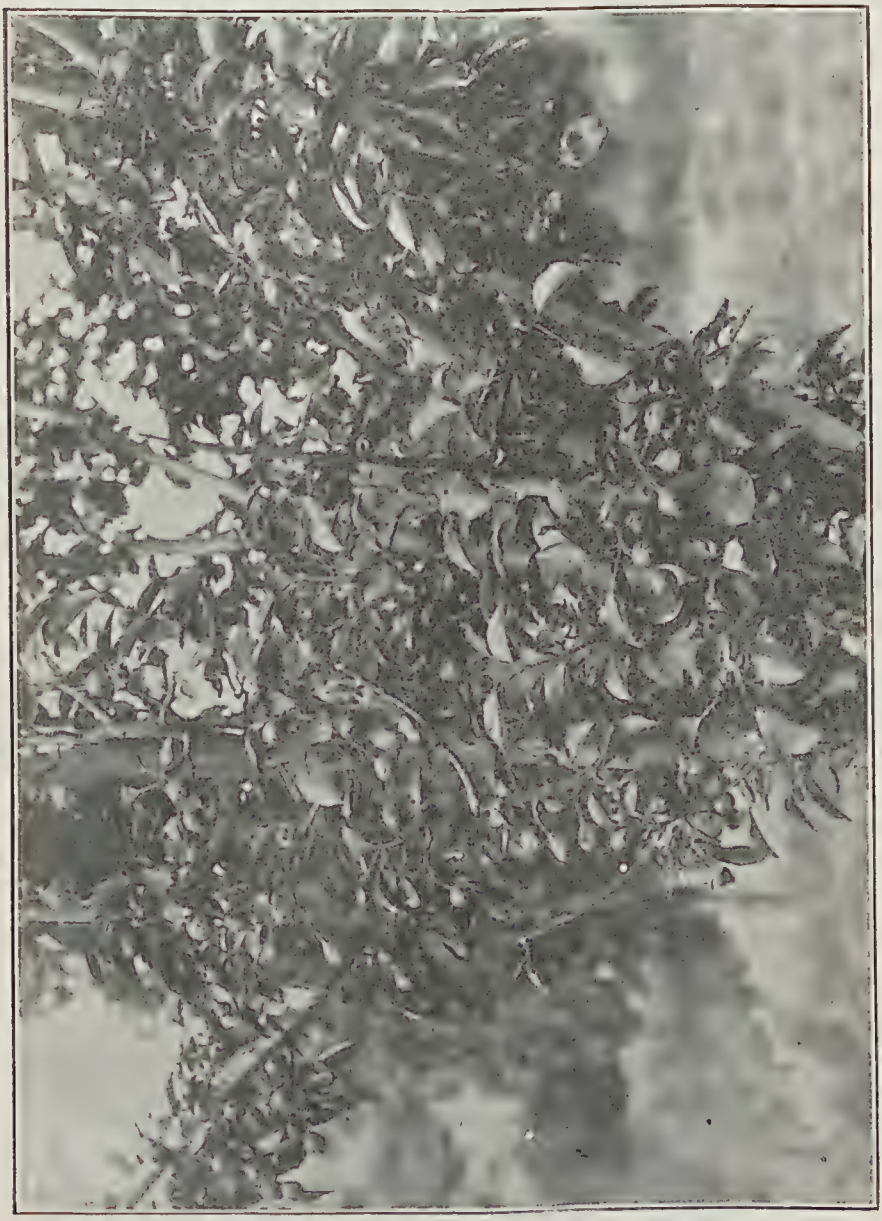


Plate No. 49.—Section of tree illustrated in Plate No. 48.

This impotency may be brought about by over-blooming on the part of the affected trees as seen in Plate No. 52 or by other causes more or less obscure, and although partial remedies such as spur-pruning may be productive of much good in assisting trees to set their fruit, yet with some varieties there appears to be a natural abhorrence to self-fertilization.

The writer has noticed particularly that the reproductive organs of some self-sterile varieties are, as a rule, physically perfect, the anthers being in a dehiscent condition, and the pollen liberally disseminated at the time when the stigma is in a receptive state, yet no fertilization of the ovules takes place, and the blossoms simply wither and fall off. This points to lack of germinal power on the part of the pollen itself. Thus it will be seen that although pollination may take place, this may not bring about fertilization, which is vitally essential to the setting of the fruit.

Plate No. 50.—Ten year old barren Kieffer Pear Tree.

In connexion with this matter other officers have made observations, and state as follows:—

Supervisor Hammond (Doncaster district).—"The result of a careful examination of the carpels, anthers, stamens, pistils, and stigmas of the 'shy' varieties was of a negative character, and up to the present time I cannot account for their infertility. An examination of the flowers of the different kinds of trees which failed to set their fruit did not disclose any defect in the essential organs of reproduction."

Supervisor Farrell (Evelyn district).—"I have not been able to detect any obstruction in the pistil tubes except in cases such as the sudden dying off of the stigma as, for instance, the Marie Louise pear before the pollen was ripe. This is not so noticeable in other kinds."

Plate No. 51.—Young Kieffer tree. Two limbs grafted with Howell to provide for cross-fertilization.

To illustrate the actual process of fertilization, a diagram of a cistus flower depleted of its sepals and petals is shown. The sexual or reproductive organs of this flower are as follows:—(A) The stamens or male organ of the flower. At the tips of the stamens, marked (a), may be seen the anthers containing the pollen. When these are quite matured they break open, and the pollen is liberated, and they are then said to be in a dehiscent condition.

In the centre, marked (B), is the pistil, and at its end, marked (b), is the stigma, usually covered with a glutinous substance, which arrests the disseminated pollen, and enables it to do the work of fertilization.

Plate No. 52.—Pear Trees overblooming—a cause of sterility.

This is effected by the pollen grains, seen adhering to the tip of the stigma, germinating and sending their delicate pollen tubes down through the pistil and impregnating the ovules (as may be seen in the illustration). When this is accomplished, but not before, fertilization results.

It will thus be seen that the process of fertilization is of a very exacting and delicate nature, and depends upon (1) the perfect bisexual structural arrangement of the bloom; (2) the germinal power of the pollen; (3) the proper condition of the reproductive organs of the flower at times of fecundation. It is rare to find blooms of the pear unisexual, and this cause of sterility need not, therefore, be considered.

Other factors influencing the fertilization of blooms are—(*a*) fine sunny days during blooming period; (*b*) activity of bees and other insects.

The importance of fine weather during blooming time cannot be overestimated, for in the presence of sunshine bees and insects are generally flying from flower to flower in search of the sweet secretion called nectar, and their presence assists materially in the work of cross-

fertilization. Mr. R. Beuhne, in an interesting article on "Bees and Fruit Fertilization," says—"To get at the nectar the bee has to pass over the anthers, and the pollen grains adhere to the many hairs covering its body; in visiting the next flower some of the pollen falls on the stigma, and thus fertilizes the blossom, even if the bee is not gathering pollen. In gathering pollen the bee sweeps together the pollen grains with its moistened tongue, nips it off the tongue with the front pair of legs, passes it on to the second pair of legs, and finally on to the third pair, where it lodges on what is called the pollen basket, a covering of stiff hair below the upper joint. In this performance pollen grains become scattered all over the body of the bee, and as it has to visit many blossoms before it gets the amount it can carry, and passes over the stigma of every flower, pollination is always brought about. If the bee visited the blossoms of different species of plants in the same excursion there could be no cross-fertilization, because strawberry blossom, for

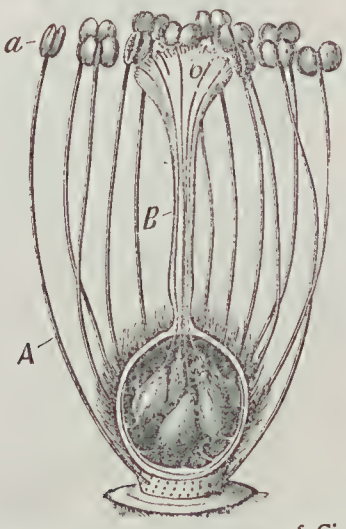


Plate No. 53.—Essential reproductive organs of Cistus flower showing fertilization of ovules.

instance, could not fertilize pear blossom. It is, however, a well-known fact that a bee during one trip confines itself to one species of plant, whether in search of nectar or pollen, and a mixture of pollen is never found in any bee's load when it enters the hive. Plants of the same species, but of different varieties, are worked over during the same trip."

No comment is necessary to show how important is the work carried on by these silent and tireless workers, for congenial weather is the only condition they require in building up their hives, and in so doing assist the fruit tree to yield bountiful crops.

Blooming of Pear Trees.

It has been noted by the writer that in blooming the different varieties of pear trees produce both early and late blooms, and that the former are often spent by the time the late blooms on the same tree become effective as pollinators. With this provision of nature it is not vitally essential for two varieties to be quite simultaneous in their time of

Plate No. 54.—The bee and the blossom.

blooming. For in the case of varieties differing by several days in the time of their first blooms appearing, it is quite possible for such varieties to be of mutual assistance in the matter of cross-fertilization. This is owing to the late blooms of the earlier blooming variey being in a fecundative condition at the same time as the early blooms of the later variety.

The average time occupied in blooming by the different varieties is found to be from twelve to eighteen days, and the average time from first blooms appearing to the full bloom period is from six to ten days. From this data it will be seen that little assistance can be expected in the process of cross-fertilization from the earliest blooming varieties with late bloomers such as Williams' Bon Chretien; yet in California, according to a bulletin on the Pollination of the Bartlett pear (known here as Williams' Bon Chretien), early blooming varieties, such as Beurre d'Anjou, Howell, and Kieffer, are said to be successfully used as a cross with the Bartlett.

This shows that the varietal blooming times of pears in America must differ to some extent from those in this State, for here the early blooming varieties mentioned would be of little use in crossing with Williams' Bon Chretien compared with varieties such as Beurre Bosc and Broompark.

For the purposes of this article the writer does not intend to publish a perplexing list of dates of the blooming times of pear varieties, but will give necessary details of how the desired effect of inter-pollination may be achieved.

Amongst the varieties to be enumerated are some that are not of high commercial value, so that in choosing a variety to inter-plant it is advisable to select one that is of good commercial value in addition to its being helpful as a pollinator.

It is intended to divide the varieties into three sections in their order of blooming. Section (A) comprises those varieties of early blooming habit, Section (B) the intermediate, and Section (C) the late bloomers. To get the greatest effect from inter-pollination, it is advisable when planting a certain variety to choose another variety in the same section as a pollinator. Although some mutual benefit would no doubt be derived by planting varieties chosen from Sections A and B, or B and C, little could be expected from A and C. At any rate, although there are a good many details yet to be worked out as to the direct effect of one variety upon another, it is found that varieties which are nearly simultaneous in their blooming times give the best results as inter-pollinators.

Section A.

Bakehouse's Bergamot.
Beurre d'Anjou.
Beurre Clairgeau.
Brockworth Park.
Citron des Carmes.
Easter Beurre.
Forelle.
Garber's Hybrid.
Harrington's Victoria.
Howell.
Kieffer.
Lawrence.
Le Conte.
Marechal de la Cour.
Monchallard.
Poire de Berriays.
St. Michael Archangel.

The best commercial varieties in this section are Beurre d'Anjou, Beurre Clairgeau, Harrington's Victoria, Howell, Kieffer, and Lawrence.

Section B.

Beurre de Capiaumont.
Beurre Giffard.
Beurre Diel.
Beurre Hardy.
Black Achan.
Brown Beurre.
Brown Windsor.
Catillac.
Clapp's Favourite.
Cole's Hybrid.
Doyenne Boussock.
Doyenne du Comice.
Durondeau.
Elizabeth Cole.
Fertility.
Flemish Beauty.
Golden Beurre.
Gansell's Bergamot.
Glou Morceau.
Idaho.
Jargonelle.
Urbaniste.
Josephine de Malines
Lady Lynn.
L' Inconnue.
Louise Bonne of Jersey.
Madame Cole.
Mount Vernon.
Napoleon.
Neverfail.
Packham's Triumph.
Pitmaston's Duchess.
Souvenir du Congress.
Summer Bon Chretien.
Swan's Orange.
Uvedale's St. Germain.
Vicar of Winkfield.
Winter Cole.
Winter Nelis.

The best commercial varieties in this section are Beurre de Capiaumont, Black Achan, Clapp's Favourite, Doyenne Bonssock, Doyenne du Comice, Durondeau, Gansell's Bergamot, Glon Morceau, Josephine de Malines, Madame Cole, Packham's Triumph, Souvenir du Congress, Vicar of Winkfield, Winter Cole, Winter Nelis.

Section C.

Autumn Bergamot.
Bailey's Bergamot.
Beurre Bosc.
Broompark.
Laffer's Bergamot.
Marie Louise.
Williams' Bon Chretien.

The best commercial varieties in this section are Beurre Bosc, Broompark, Marie Louise, Williams' Bon Chretien.

Planting the Trees.

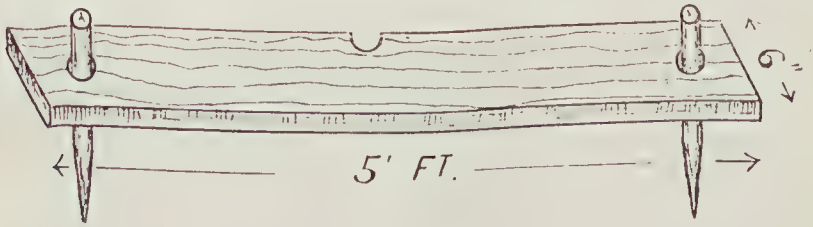
When the young trees are received from the nursery it is a good plan to heel them in the ground at once in order to prevent the roots from becoming dry through exposure to the sun and wind. Many cases of trees failing to come away into thrifty growth after planting may be attributed to the dried-out condition of roots caused by their being too long out of the ground. A shallow trench should be dug in a well drained situation to receive the trees, the roots being covered with fine soil until time of planting the trees out in their permanent positions.

There is no gain in planting the trees too early, for trees hastily placed in cold wet soil are not benefited, but rather retarded in their subsequent growth. They should, if possible, be planted out just before the young rootlets begin to develop from the heavier root system, and in the southern portion of the State this growth may be looked for towards the end of July.

It is almost impossible when young trees are being removed from the nursery rows to guard against some interference with their root system, and frequently the roots are broken, leaving them with ragged ends. Before planting, therefore, these broken ends shoull be cut off cleanly; by so doing callusing will be facilitated, and the development of new roots promoted. When cutting off the ends of the young roots,

the cut should always be made so that the callus and subsequent root development will have a downward tendency.

In order to secure accuracy in planting the trees, and to ensure their being quite in line, it is necessary to place the trees in exactly the same position as that occupied by the peg. This is sometimes done by sighting, but the better plan is to use what is known as the planting board. This may be made of a 5-foot length of ordinary 6 inch x 1 inch flooring board. A small peg-hole is made near each end of the board, and a notch in the centre as seen in the accompanying diagram (Plate No. 55).



Planting Board

Plate No. 55.

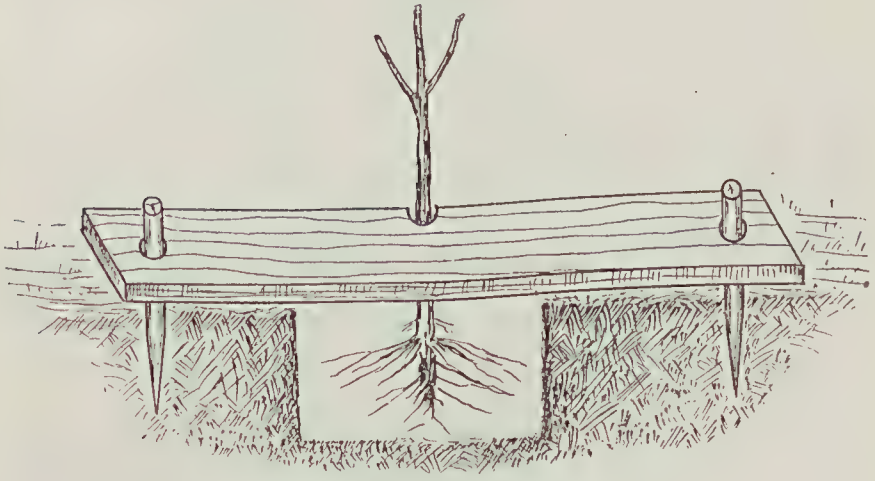


Plate No. 56.—Tree placed in position.

When planting operations are commenced, the notch in the centre and side of the board is placed at the peg, and an iron stake driven into the ground through each peg-hole near the ends of board. The board is then lifted off the stakes, which are allowed to remain in the ground. After the hole for the tree is prepared the board is again placed in position, the stem of the young tree being placed in the notch of the board, and the filling in of the hole completed. Plate No. 56 shows the board and young tree placed in position. Care should be exercised to see that the young tree is not planted too deeply in the soil, the proper depth being that at which the tree was established in the nursery. This

may be determined by the appearance of the bark on the stem. When filling in the hole round the roots fine soil should be used for the purpose, as if clods or stones are placed on the roots the compactness of soil necessary for root development is not secured.

By attending to these details in planting the necessary work entailed will be more than compensated for by the regular appearance of the rows and the growth of young trees.

(To be continued.)

SOUR SOIL.

Sour soil conditions arise from several causes: The alkalinity may have been reduced by cropping land without liming; the decaying process of the green roughage, manure, and other organic matter turned in, and the excretions of the plant roots, may all have helped to set up the acid condition. The acid condition has sometimes been charged to the continual use of chemical fertilizers, but the scientific men have exploded this theory. Dr. Wheeler, formerly Director of the Rhode Island Experiment Station, says:—It is well established that if a soil to which superphosphate has been added remains quite moist for a considerable length of time, the sulphate of lime which is associated with the superphosphate may be partly changed to carbonate of lime within the soil by processes of reduction. When this occurs, the carbonate of lime which is formed will naturally tend to lessen the acidity of the soil."

Recently, Professor S. D. Conner and his fellow workers at the Indiana Agricultural Experiment Station have shown that acid soils and silicates, after receiving acid phosphate, were less acid than when they were untreated.

They believe this is due principally to the re-action of the phosphoric acid upon salts of aluminum.

Director Brooks, of the Massachusetts Agricultural Experiment Station, has conducted field experiments with superphosphate covering a period of many years. He states that "no injurious secondary effects are known to be associated with any reasonable use of dissolved phosphates."

The question has been studied likewise by Professor G. H. Hite, of West Virginia University. He has tested hundreds of samples of soil from various parts of West Virginia, and reports that three-fourths of the sour soils and practically all of the sourest soils in that State have never had fertilizer.

It appears, therefore, that fertilizers, which some people have been condemning because they were supposed to increase soil acidity, really lessen it, and thereby actually improve their chemical re-action.

[*Farmers' Union Advocate, New Zealand.*

STANDARD TEST COWS.

Report for Quarter ended 31st December, 1919.

The cows which completed the test numbered 110, of which 93 qualified for certificates. Individual returns are as follow:—

J. BAKER, Gheringhap. (Red Poll.)

Completed since last report, 2. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
Elcho Lady	Not yet allotted	16·3·19	273	lbs. 14¼	lbs. 7,138	4·82	lbs. 344·21	lbs. 250	lbs. 392¼

Mrs. A. BLACK, Noorat. (Jersey.)

Completed since last report, 4. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
Madge	3575	17·3·19	273	lbs. 9	lbs. 5,705	5·14	lbs. 293·46	lbs. 250	lbs. 334¼

CALLERY BROS., Bannockburn. (Ayrshire.)

Completed since last report, 2. Certificated, Nil.

Dr. S. S. CAMERON, Hawthorn. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
Merella II. of Yarra Brae ..	5668	8·3·19	273	lbs. 17	lbs. 4,831	6·83	lbs. 329·96	lbs. 175	lbs. 376¼

DEPARTMENT OF AGRICULTURE, Werribee. (Friesian and Red Poll.)

Completed since last report, 8. Certificated, 7.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Friesian.									
Dominion Milkmaid ..	714 N.Z. F.H.B.	14·3·19	273	36½	11,862	3·83	454·71	250	518¼
Red Poll.									
Aleutia	Not yet allotted	16·1·19	273	14	6,299	4·11	259·14	250	290½
Panama	,,	20·1·19	273	23	8,460	4·14	350·01	250	399
Santa Clara	,,	26·1·19	229	4	6,136	4·59	281·54	250	321
Gallipoli	,,	29·1·19	263	4	6,312	4·00	252·67	250	288
Baltica	,,	13·2·19	273	17	8,555	4·42	378·36	250	431¼
Tasmania	,,	15·2·19	273	17½	7,820	4·19	327·77	250	373½

C. FALKENBERG, Elliminyt. (Jersey.)

Completed since last report, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Fancy of Colac	4027	6·2·19	273	27	6,982	4·64	324·44	250	369¾
Trixie of Colac	4914	16·3·19	273	17½	5,553	5·48	304·16	200	346½

W. A. FRANCIS, Kilcunda. (Ayrshire.)

Completed since last report, 2. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Red Rose of Fern Hill ..	Not yet allotted	14·2·19	273	18	6,306	4·11	259·31	200	295½

A. JACKSON, Glen Forbes. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Maitland's Floss	423 C.S.H.B.	4·1·19	273	16	5,553	5·22	289·91	250	330½
Graceful Duchess XII. of Melrose	5539	4·3·19	*191	15	4,526	6·19	280·32	250	319½

* Sold before completion of term.

S. A. JOHNSON, Woodend. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Molline of La Motte ..	5259	10·2·19	273	21	5,420	5·05	273·86	175	312½

A. W. JONES, Whittington, *viâ* Geelong. (Jersey and Friesian.)

Completed since last report, 6. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Jersey.									
Jubilee XV.	5056	18·1·19	273	32½	10,412	5·20	551·67	250	629
Lady Grey V. of St. Albans	5038	22·1·19	273	23	7,418	5·43	402·65	200	459
Mermaid IV. of Melrose ..	6307	7·3·19	273	15½	6,170	6·44	397·09	200	452½
Silver Queen II. of Colac ..	4032	17·3·19	273	24	6,770	6·21	420·52	250	479½
Friesian.									
Pauline	Not yet allotted	12·2·19	273	17½	9,931	4·06	403·29	200	459½
Bolobek Bess	,,	18·3·19	273	25½	10,436	4·04	421·77	250	480½

C. G. KNIGHT, Cobram. (Jersey.)

Completed since last report, 20. Certificated, 19.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Wattle of Tarnpirr ..	6040	*30.12.18	273	13	4,477	6·25	279·68	175	318¾
Lilac of Tarnpirr ..	6028	8·1·19	273	21½	6,772	4·79	324·96	175	370½
Beautie of Tarnpirr ..	6023	18·1·19	273	16	5,271	6·56	345·88	175	394¼
Cooee of Tarnpirr	6025	21·1·19	273	16½	4,906	6·66	326·85	175	372½
Good Day of Kameruka ..	6027	28·1·19	273	21	7,614	4·58	348·70	175	397½
Pidgeon of Kameruka ..	6035	6·2·19	273	20	6,933	5·54	383·93	175	437¾
My Queen of Tarnpirr ..	4209	8·2·19	273	11½	5,803	5·77	334·98	250	381¾
Miss Fox of Tarnpirr ..	5162	11·2·19	273	21	6,576	5·62	369·32	200	421
Alice of Tarnpirr	4205	15·2·19	273	21½	7,215	5·49	395·91	250	451¼
Princess May of Tarnpirr ..	5168	15·2·19	273	18½	6,390	4·83	308·40	250	351½
Christmas of Tarnpirr ..	4206	1·3·19	273	15½	5,694	6·13	349·32	250	398¼
Mistletoe of Tarnpirr ..	2984	1·3·19	†216	16	5,478	4·84	265·44	250	302½
Pastime of Tarnpirr ..	5164	1·3·19	273	13½	5,505	5·58	307·34	200	350½
Romany Girl of Tarnpirr ..	5171	4·3·19	273	18	7,089	5·29	374·80	200	427½
Veronica of Tarnpirr ..	5174	8·3·19	†271	21½	6,714	5·03	338·02	200	385½
Wedding Bell of Tarnpirr ..	6041	10·3·19	†269	17	5,515	5·93	326·91	175	372¾
Bluebell of Tarnpirr ..	6024	15·3·19	†264	15	5,071	5·30	268·66	175	306½
Postcard of Tarnpirr ..	5167	22·3·19	†257	16	5,518	6·20	342·43	200	390½
Rosebud of Tarnpirr ..	4210	23·3·19	†256	18	6,029	5·76	347·31	250	396

* Calved prematurely. † Sold before completion of term.

J. A. LANG, ALVIE. (Ayrshire.)

Completed since last report, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Docy of Yalart	3146	18·2·19	273	9½	7,183	4·79	344·02	250	392½
Peggy of Riccarton ..	Not yet allotted	14·3·19	273	5½	6,753	4·86	328·04	200	373¾

H. LIDGETT, Myrniong. (Shorthorn.)

Completed since last report, 4. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Moss Rose XIII.	Not yet allotted	10·2·19	273	8	6,520	4·31	281·51	175	321
Daphne XXI.	,,	3·3·19	273	4	5,021	3·90	195·93	175	223½
Ruby II.	,,	20·3·19	273	14	8,135	4·34	353·07	250	402½

C. G. LYON, Heidelberg. (Jersey.)

Completed since last report, 9. Certificated, 9.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lassie VII. of Banyule ..	6069	2·1·19	273	12¼	4,127	5·69	234·99	175	267¾
Thora IV. of Banyule ..	6083	2·1·19	273	16¼	5,312	5·28	280·88	175	320¼
Melford Mascotte	5215	3·1·19	273	20	6,860	5·54	380·54	200	433¾
Statuette	4251	1·2·19	273	15	6,843	5·77	394·93	250	450¼
Ettie V. of Banyule ..	5204	7·2·19	273	22	7,548	5·38	406·03	200	462¾
Silvermine XIII. of Banyule	4250	10·2·19	273	22¼	6,854	5·20	356·79	250	406¾
Lassie VIII. of Banyule ..	6070	16·2·19	273	14¼	4,984	5·46	272·11	175	310¼
Molly V. of Banyule ..	5216	27·2·19	273	17¾	7,730	5·73	442·74	250	504¾
Starfinch III.	6082	27·3·19	273	12¾	4,462	5·98	267·02	175	304¼

MEIER BROS., Box Hill. (Jersey.)

Completed since last report, 2. Certificated, Nil.

T. MESLEY, Dalyston. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Shadow of Luscombe ..	6143	9·1·19	273	13¼	4,815	5·83	280·90	200	320¼
Keynote	5247	7·2·19	273	22¾	6,436	6·29	405·11	200	461¾
Garenne III. of Warenda ..	6140	16·2·19	273	11	3,777	5·80	219·18	175	249¾

MUHLEBACH BROS., Batesford. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Gracie of Retreat ..	5386	25·3·19	*261	11½	5,640	4·83	272·46	175	310½

* Withdrawn before completion of term.

Mrs. L. ORCHARD, Grahamvale. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Pansy of Grahamvale	5330	25·1·19	273	10	4,021	5·30	212·97	200	242¾

W. PARBURY, Warburton. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Sweet Alice	532 C.S.H.B.	5·1·19	273	9	4,960	6·18	306·45	250	349¼

R. RALSTON, Moglonemby. (Ayrshire.)

Completed since last report, 2. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Princess of Ben Kell	3054	20·3·19	273	12	7,498	4·43	332·09	250	378¼

J. D. READ, Springhurst. (Jersey.)

Completed since last report, 8. Certificated, 8.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Verbena of Springhurst ..	5407	21·2·19	273	14½	5,663	5·15	291·43	250	332¼
Balsam of Springhurst ..	4376	3·3·19	273	15	6,508	5·29	344·61	250	392¼
Penstemon of Springhurst ..	6205	21·3·19	273	10¼	4,613	5·18	239·17	175	272¼
Czarina of Springhurst ..	4380	25·3·19	273	12	7,063	5·53	390·75	250	445¼
Dolichos of Springhurst ..	6203	25·3·19	273	11	4,326	4·63	200·40	175	228¾
Dauphine of Springhurst ..	6202	25·3·19	273	12½	4,308	5·83	251·12	175	286¼
Clover of Springhurst ..	6201	26·3·19	273	11	4,685	5·62	263·26	175	300
Daffodil of Springhurst ..	4381	26·3·19	273	13	5,819	5·77	335·57	250	382¼

Miss BRUCE REID, Bundoora. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Willoh's Dagmar	551 C.S.H.B.	26·12·18	273	10½	4,489	5·55	249·54	200	284½
Wynda Wildflower ..	Not yet allotted	14·1·19	273	11	4,904	5·51	270·34	175	308½
Jubilee Hydrangea ..	,,	19·3·19	273	11½	3,716	4·89	181·70	175	207½

C. J. REID, Devenish. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Chevy VI. of Melrose ..	3635	12·3·19	273	18½	6,598	4·14	273·07	250	311½

Miss S. L. ROBINSON, Malvern. (Jersey.)

Completed since last report, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Kyora's Defender's Claribelle II.	Not yet allotted	27·1·19	273	12½	4,388	5·03	220·59	175	251½
Pilbara of Kyora	6221	28·1·19	262	4	5,188	6·07	315·25	200	359½
Puen Buen Velvet VII. ..	3973	29·1·19	273	12	5,443	4·69	255·00	250	290½
Bonnie Doon's Pride ..	Not yet allotted	20·3·19	273	9	4,291	5·91	253·53	175	289

G. ROWE, Kardella. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Rose	509 C.S.H.B.	31·12·18	273	8	5,692	4·63	263·71	250	300½

SADLER BROS., Noorat. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
Ruthven of Yalart ..	5849	18·3·19	253	lbs. 7½	lbs. 6,461	3·91	lbs. 252·74	lbs. 200	lbs. 288

AGRICULTURAL HIGH SCHOOL, Sale. (Ayrshire.)

Completed since last report, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
Madeira Flinders	1740	30·12·18	273	lbs. 20	lbs. 8,391	3·99	lbs. 334·65	lbs. 250	lbs. 381½
Young Madeira of Latrobe ..	4814	8·2·19	273	13	5,482	4·10	225·03	175	256½

A. H. SCHIER, Caldermeade. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
Phyllis	4639	15·1·19	273	lbs. 12	lbs. 4,615	4·38	lbs. 202·00	lbs. 175	lbs. 230½

A. E. SPIERS, Nalangil. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
Molly V. of Ayrshire Bank ..	5971	18·1·19	273	lbs. 37½	lbs. 10,055	3·51	lbs. 353·28	lbs. 250	lbs. 401½

O. J. SYME, Macedon. (Friesian.)

Completed since last report, 5. Certificated, 5.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Queen of Friesland Park ..	Not yet allotted	10·1·19	273	31	11,351	3·52	400·20	250	456¼
Domino's Hergerveld Belle	,,	21·1·19	273	25	10,195	3·90	397·94	250	453¾
Princess Ena	,,	23·1·19	273	30½	11,448	3·86	441·88	250	503¾
Bolobek Jean	,,	9·3·19	273	23	9,338	3·84	358·52	200	408¾
Duchess of Friesland Park ..	,,	10·3·19	273	24½	10,045	3·57	358·89	250	409

G. H. WINDSOR, Pakenham. (Jersey.)

Completed since last report, 1. Certificated, Nil.

W. WOODMASON, Malvern. (Jersey.)

Completed since last report, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Quality VI. of Melrose ..	3674	28·1·19	273	31	10,004	4·90	489·99	250	558½
Pearl II. of Melrose ..	3670	6·2·19	273	12½	4,623	5·42	250·83	250	286
Lady Elector III. of Melrose	5549	18·2·19	273	17¼	6,437	6·27	403·85	250	460½
Fuchsia X. of Melrose ..	4516	19·2·19	273	23	10,230	4·12	422·18	250	481¼

SOME FRENCH SWEET WINES.

By F. de Castella, Government Viticulturist.

(Continued from page 111.)

The Rancio Wines of Rousillon.

Only in the extreme south of France are wines produced in any way similar to the Ports of the Alto Douro (Portugal). The district which has specialized in this type is a small one, constituting the extreme south east corner of the ancient province of Rousillon, the boundaries of which differ little from those of the modern Department of Pyrénées Orientales (Capital Perpignan). Though resembling Port in some respects, these wines differ considerably in their lower alcoholic strength. The sweet rancio wines of Rousillon contain, as a rule, 26 per cent. of proof spirit, as against 37 per cent. and even 40 per cent for true Ports.

Rousillon is a most picturesque and romantic part of France, especially the portion near the coast traversed by the railway from Spain, which is the region producing the special wines under review. Shortly after entering France at the frontier station of Culera-Cerbère, one passes the three railway stations of Banyuls, Port-Vendres, and Collioure, names well known in French wine circles, especially Banyuls and Collioure, which stand for the best and most typical rancio wines produced in France. The train passes through many tunnels, between which one gets glimpses of steep hillsides terraced with vineyards or clothed with cork oak and pine forests, with here and there a massive tower, a relic of bygone heroic days when the Rousillon, like other frontier districts was the scene of many wars.

Here on the lower slopes of the Pyrenees, quite close to the point where the Franco-Spanish frontier runs into the Mediterranean, climate and soil conditions—with the exception of the proximity to the sea—differ but little from those at Rutherglen. Rousillon is about the warmest part of France, and the Pyrenees, like our Australian Alps, are mainly of primary geologic age. The foothills in this neighbourhood are not unlike the lower ranges in many parts of North-East Victoria.

The wines for which Banyuls and Collioure ars so well known constitute a type different to anything else produced in France. Wines which differ a good deal in colour, sweetness and also in alcoholic strength, but which belong to the distinct class known in France and Spain as "Rancio."

This term is defined in the dictionary of Larousse as "a Spanish wine which has become yellowish with age," in other words—a tawny wine—not only has the colour changed, but bouquet and flavor are also considerably modified, having taken on a peculiar "nuttiness," due to oxidation and reminding of both Port and Madeira—in fact what we would call a "Porty" character.

The rancio development is undoubtedly an oxidation phenomenon, akin to *casse and maderisation*, which are defects in dry table wines; it is probable that a soluble ferment or enzyme, similar to oxydase, which causes casse, is responsible for the transformation. It seems to

be quite independent of the growth of any micro-organism, thus differing radically from the "Fino" character of Sherry, due to the growth, on the ullaged surface of the wine, of the "Flor" fungus, closely allied to mycoderma vini. Nevertheless, the cask in which the wine is stored seems to have much influence; a young wine placed in a cask which has previously contained rancios, develops this character much more rapidly than it otherwise would. For this reason the wine-growers of the region jealously guard their old casks, which, from father to son, have been used for the storing and ripening of these wines.

Wines made from the Grenache grape, grown on primary schistose and slaty soils, rapidly become rancio. Indeed this remarkable variety seems largely responsible for this peculiarity, especially on the slopes of the Pyrenees, both on the French and the Spanish sides. It is worthy of note that the Ports of the Alto Douro are also grown on primary schistose soils, though the grapes which yield them are altogether distinct from Grenache. *Bastard*, one of the chief Port varieties, shows a similar instability of colour.

Grenache does not always produce such wines; when grown on limestone formations of tertiary age so common further east—near Montpellier, for example—it yields wines of ordinary dry red type. Even here, however, its colour is less stable than that of most other red grapes. It is only when planted on primary schists and slates that the rancio character becomes fully developed, a remarkable example of the co-operation of the two factors, variety and soil, in influencing the type of wine produced.

The neighbouring Priorato district of Spain* has long been celebrated for its rancio wines; wines very similar to those of Rousillon, which is scarcely surprising, seeing that they were almost exclusively made from Grenache, or Garnacho, as it is known in Spanish, grown on soils of exactly similar geological formation.

It is to be regretted that the ancient reputation of the Priorato Rancios is largely a thing of the past, since certain merchants found it more profitable to blend the pure Grenache wines grown on the slaty hills with the more neutral produce of neighbouring districts. The resulting blends are largely shipped to England, formerly under the once familiar name of "Tarragona Port," a misuse of a regional term, which international legislation no longer tolerates.

Large quantities of blended Priorato are also shipped to South America under the name of *Priorato de mesa*, a lighter and drier wine than that in demand in England, and not fortified to any extent. These wines possess a somewhat attenuated rancio character.

Transplanted from its native Rousillon and Priorato to Victoria, Grenache retains its striking characteristics. The hillsides of Rutherglen, of identical geological formation to the foothills of the Pyrénées suit it admirably; when vintaged on the over-ripe side, and its sweetness retained by fortification, it develops a tawny colour and a rancio taste, the characteristics so desirable in a sweet wine, to a greater extent and in a shorter time than almost any other grape. A sweet Grenache shows as much quality and age at two years as a Syra (Shiraz) made under similar conditions would at four or five years.

* See Journal, 10th May, 1909, p. 314.

In France and Spain several sub-varieties of Grenache are grown. In addition to the typical black variety, the only one as yet introduced into Victoria, there is a red or grizzly form, known in French as *Grenache Gris,* and in the Rousillon patois as *Lladounet.* There is also a white Grenache. These are only colour variations of the well known black Grenache, which is by far the most important.

Semichon (*Ampelographie,* Vol. VI., p. 285) shows how Grenache enters into the composition of several quite distinct wines. In addition to the sweet wines under review—

This variety is grown in many vineyards yielding choicer wines (than vin ordinaire). Gathered at normal maturity (11 deg. to 13 deg. B.) it communicates to the wine its characteristic refinement and smoothness. Wine made from Grenache alone ages too rapidly, developing the rancio taste, which is as disagreeable in ordinary dry, red wines as it is desirable in a liqueur wine. The colouring matter becomes oxodized and is precipitated, the wine turning to an amber, Madeira-like tint. At Corbiéres* the recognised proportion used to be one-fifth Grenache to four-fifths Carignane. The roundness, smoothness, and refinement of the first, correcting the harshness of the second without the proportion of Grenache being sufficient to cause the wine to age too rapidly.

Grenache also yields full-bodied, blending wines, rich in colour and more or less fruity. These are grown on poor land and vintaged at 13 deg. to 15 deg. B. By this time the colour has greatly increased, and the partial mortification of the skins facilitates its diffusion in the fermenting vat. The resulting wines, rich in colour and often rather fruity, are much sought after by the trade for blending purposes. It has been erroneously stated that such wines are made from a mixture of Grenache and Carignane. Far more esteemed are the pure Grenache wines made under these special conditions, which, owing to their colour, alcoholic strength, body, and constitution, are much superior to wines made from Carignane. Vintage is as late as October (April here), fermentation taking place in casks not exceeding 1,300 to 1,700 gallons.†

When the muste registers as high as 18 deg. or 20 deg. B. the wine retains a few degrees of sweetness and ferments again in the spring. Purchasers from afar take advantage of the cold weather during January (mid-winter in Europe) to transport them.

But it is for the production of wines of rancio type that Grenache is most particularly adapted. Sometimes a small proportion of Carignane—a tenth, rarely a fifth, of the weight of Grenache—is blended in, but the latter is always the dominant variety, and the best wines are made from it alone.

These wines are of several distinct types, as will be seen from the analyses quoted below. The method of making the wine naturally varies according to the type required. The district certainly owes its reputation to the true Rancios, similar to old Spanish Priorato, usually of light, tawny colour, and varying from an almost dry wine, reminding of a brown Sherry or Madeira, to a distinctly sweet wine. These are highly esteemed as dessert or liqueur wines.

Within the past thirty years a demand has arisen for wines of darker colour, and a considerable proportion of the wine of the region is now made accordingly, being utilized for the manufacture of various medicinal and tonic wines, known variously as *vin de Quinquina* (a sort of red quinine wine) and as apéritifs or appetizers, a glass being taken before lunch or dinner, just as Vermouth is. Many proprietary brands, widely advertised in France under such well known names as

* Corbières produces a well-known red wine of Southern France, full bodied and dry, not unlike the Australian wines shipped to London.

† Very large fermenting vessels are the rule in Southern France. Storage casks of a capacity of up to 7,000 or 8,000 gallons and provided with a manhole in the upper part, to permit the entry of the crushed grapes, are commonly used instead of fermenting vats. After vintage they serve as storage casks.

Byrrh, Amer Picon, &c., have, as a foundation, the wines of Banyuls and Collioure.

The old-style Rancios are usually fermented apart from the skins, whilst in the case of the darker coloured wines fermentation with the skins is practised. Sometimes a highly coloured extract is made by treating the pressed skins with spirit and adding this to the new wine previously extracted from them.

According to Feret*—

The wines of Banyuls-sur-mer are in great demand as tonic wines and employed for the preparation of Vins de Quinquina. With age they become rancio and constitute choice dessert wines.

They are made from Grenache, either alone or mixed with a little Carignane. The grapes are pressed immediately after gathering, and the juice fortified by the addition of 2½ degrees of spirit. (These are French degrees. This would correspond to the addition of 2¾ gallons of 60 over proof spirit to each 100 gallons of must.) It is immediately placed in casks, without preliminary vatting. The liquid gradually clears and becomes fit for consumption. Formerly the grapes were vatted or fermented on the skins, and the alcoholic strength raised to 18 deg. (31.4 per cent. proof) by a small addition of spirit.

Coste Floret† describes a somewhat different method—

The wines of Banyuls are made from the Grenache variety, also known as Alicante.

The grapes are gathered past complete maturity and pressed immediately after stemming and crushing.

In order to dissolve the colouring matter of the grape, the marc, after removal from the press, is macerated with 90 per cent. alcohol (57.8 over proof) at the rate of 15 or 20 litres for each 100 litres of must extracted. This pasty mass is then pressed in order to separate the maceration products, which are equally distributed among the casks holding the must obtained from the first pressing.‡

The following abridged extracts from an article by L. Semichon, on the Vineyards of Banyuls§ relate to the making of the wine:—

Vintage is postponed until the grapes are overripe, yielding musts registering 18 degs. and 20 degs. B., fortification is practised, spirit being added either to the must or to the crushed grapes, fermentation develops and follows its course slowly, lasting for months, sometimes even for years. These wines long retain much of the sugary sweetness of the grape; after three years of careful handling they become marketable.

Thus are obtained natural sweet wines of high repute, known by such names as Grenache doux (sweet), Rancio, and Banyuls. If fermented separately from stalks and skins the wines are of a rosy colour, which turns to a flaxen russet (*roux blond*), tawny and yet golden, which, according to Bertal "seem to contain in them the sun which gave them birth."

If fermented on the skins, Banyuls or red Grenache is obtained; a highly coloured wine, which with age develops ruddy, brown tints (des reflets mordores), which is at the same time sweet and full-bodied, strong and yet delicately perfumed.

From the article by L. Semichon, on Grenache, in *Ampelographie* (Vol. VI., p. 285) the following additional particulars are taken:—

Grenache is, above all, renowned for the manufacture of liqueur wines. Over-ripeness is the rule, the grapes being allowed to shrivel. The must

* *Dictionnaire-Manuel du Négociant en Vins et Spiritueux et du Maître de Chai* (1896 edition), p. 513.

† Procédés Modernes de Vinification (1894). p. 292.

‡ Some years ago the writer prepared an extract such as that described by Coste Floret. It was made from marc pressed from over-ripe Syra (Shiraz) grapes when fermentation was about two-thirds completed. The strength was about 30 under proof (40 per cent. alcohol by volume). The bulk of the quantity made was immediately added to the wine, with satisfactory results. About 50 gallons was kept for a couple of years, by which time it had developed into a liquid of quite remarkable but yet delicate character and very useful for blending with wines of port type. Owing to technical difficulties in connection with excise regulations further experimentation on these lines was discontinued.

§ *Revue de Viticulture*, 19th April, 1906.

registers 18 degs. and 20 degs B., and scarcely .5 to .6 of total acid expressed as tartaric.

Pressed immediately and fermented apart from the skins, rose coloured wines are obtained, which retain little or no sweetness, and which "age" rapidly. These wines are kept in small oak casks which, from father to son, are used to contain the rancio. After two years the wine has developed this character, but it improves much by long storage in ullaged casks; it then becomes very aromatic (savoureux) owing to the amalgamation of the spirit and the rancio taste.

By fermenting the must after it has been fortified with 5 to 8 per cent. of neutral spirit of 86 degs. to 96 degs. (equivalent to the addition of 5½ to 8¾ gallons of 60 over proof spirit to each 100 gallons of must) Grenache doux (sweet Grenache) is obtained, a wine which is less *madérisé* and not so yellow as the above. Fermentation ceases whilst the gravity is still as high as 4 degs. or 5 degs. B. The wine is racked in winter in order to avoid, in the greatest measure possible, secondary spring fermentations. Such, nevertheless, usually develop to a varying extent, and these wines ferment very gently and for a long time. This type is nearly always of cleaner taste than blending wines (see p. 172), cleaner than the dry Rancios, and cleaner even than the Banyule type. No doubt, owing to the action of the spirit, which plays the part of an antiseptic, bringing about, from the commencement of the fermentation, a selection of yeasts.

Finally, if shrivelled Grenache grapes are fermented on the skins with the addition, immediately after crushing, of only 2 degs. to 4 degs. of spirit (2½ to 4½ gallons of 60 over proof spirit to each 100 gallons) true Banyuls is obtained; a very fruity wine (vin liquoreux), sweet, and at the same time alcoholic, possessing much colour, which, however, turns brown fairly rapidly with age. These wines, which are greatly esteemed, resemble Tinta de Rota.§ During fermentation high temperatures must be avoided, as they result, more often than is realized, in the wine becoming sweet-acid and mannitic.

Gravities of musts of different vintages gathered in several localities of the region are listed, varying from 13½ degs. B. to 16½ degs. B., the average being 15½.

Analyses follow of three Grenache wines of distinct types. Nos. I. and II. are unfortified, natural wines, whilst No. III. is a typical sweet Banyuls, made by fortifying Grenache must to the extent of 6 degs. or 8 degs. of spirit (6½ to 8¾ gallons 60 over proof spirit per 100 gallons).

No. I still retains some of the original sweetness of the grape, whilst No. II is practically dry.

	No. I. Sweet Grenache, natural fermentation.	No. II Dry Grenache, natural fermentation.	No. III. Sweet Grenache, fortified.
Proof Spirit .. .. .. per cent.	26·2	26·2	2·8
Sugar as Glucose .. .. „	4·38	·15	13·2
Total acid grammes per litre (as sulphuric)	4·5	4·6	3·9
Volatili „ „ „	·89	·85	·45
Glycerine .. .. grammes per litre	11·2	10·4	14·1
Sulphate of Potash .. „ „	·49	1·09	·33
Ash .. .. .. „ „	2·32	3·82	2·33

§ The well-known wine of Southern Spain known in England as Rota Tent.

Analysis of Two Rousillon Wines Collected by the Writer in 1908.

	Banyuls, 1907 Vintage.	Collioure, 1906 Vintage.
Alcohol as proof spirit .. .. per cent.	25·95	26·45
Total sugar (after inversion) .. .. „	8·59	6·92
Sugar free extract .. .. „	2·33	2·40
Sulphates (as K_2SO_4) .. .. .. grammes per litre	·36	·49
Acidity—Total, as tartaric .. .. .. „ „	3·8	4·4
„ Volatile as acetic .. .. .. „ „	·6	1·1
Total SO_2 .. .. mgrams „	6·	6·
Free SO_2 .. .. „ „	3·	3·

From the foregoing, it will be seen that French rancio wines are made from over-ripe Grenache grapes grown on primary slate and schist formations. Fortification, if practised at all, consists in the addition of spirit at the commencement, and not at the close of, fermentation. These wines retain considerable sweetness, notwithstanding their comparatively low alcohol strength, which is usually in the neighbourhood of 26 per cent. proof.

(To be continued.)

CANADIAN WONDER BEANS.

By Temple A. J. Smith, Tobacco Expert.

This is a crop which has considerable possibilities in Victoria, but so far it has been confined to a very few localities, chiefly in the Orbost and North-Eastern Gippsland districts. There are many other parts of Victoria which should produce good crops, and probably only the introduction of the idea and a description of the climates, soils, and methods of cultivation and management may lead to the extension of the industry.

In America the production of the bean crop reaches large proportions, and proves highly profitable to the growers. In the United States an area of over 800,000 acres is planted, the yield being 11,250,000 bushels of 60 lbs. per bushel—an average of 14 bushels per acre, and in Canada 50,000 acres gave 1,000,000 bushels, or an average of 20 bushels. These yields are low as compared with Victorian returns, crops at Orbost yielding up to 60 bushels per acre. No average can be

given, as a record has not been kept of the returns from this particular crop, but statistics for all beans grown in the State are given as 1,377 acres, yielding an average of 13 bushels per acre. When it is remembered that this includes garden and other beans, it will be understood that the average yield of Canadian beans is much higher, as they are heavy yielders as compared with others.

Prices recently have been high, reaching 50s. per bushel, owing to scarcity of the supply; but previous prices ranged from 11s. to 25s. per bushel. The crop, therefore, should be a very remunerative one, provided it is grown under suitable conditions.

The bean crop requires a cool and moist climate, with freedom from frost during the growing period, and with sufficient summer showers to keep the crop growing. Such climates are to be found along the foothills of the Dividing Range and the coastal districts of North-Eastern Gippsland.

Soils suitable are good alluvial river flats containing lime and of a loamy nature; silty soils with a good supply of organic matter will also produce good crops. Efficient drainage is essential in all cases. As a general guide it may be said that almost any soil and climate that will produce good maize will produce beans.

Manures are not used to any extent at present in Victoria, but there can be no doubt, on the lighter soils, that decomposed farm manure would be advantageous, and, where soils are deficient in lime, dressings of gypsum or ground limestone, at the rate of from half to one ton per acre, would give good results. Sulphate of potash and superphosphate, at the rate of 1 cwt. each, would also add to the yield on soils requiring them. Lime and manure should be applied three weeks before planting.

The time to plant beans depends upon the district. They should not be planted until all danger of frost is past, as the young plants are very tender. Generally speaking, the end of October or early November is best; later sowings often give good returns.

About 1½ bushels will plant an acre. The seed should not be put in too deeply; from 1 inch to 2 inches is as far as it should be down. The stiffer the soil, the shallower the depth to sow. The beans should be sown in rows from 24 to 26 inches apart, with from 5 to 6 inches in the drills.

In order to keep the land free of weeds, the horse-hoe should be used between the rows to keep the soil worked and weeds down, until the plants are too large to permit of a horse working between the drills, after which hand hoes are required. It is very necessary to keep the crop clean, as the presence of weeds at harvest time will complicate the drying process, and cause loss and extra work. Weeds will also have the effect of considerably reducing the yield of the crop.

Good cultivation is very necessary for beans, and the soil must be brought into fine and clean condition before planting. A fallow at least three months or more before the planting season will always be of benefit. This will have the effect of sweetening the land, and give all vegetation time to rot down thoroughly. Undecomposed vegetable matter will hinder seed sowing, and harbor insect pests. The ploughing should be deep; the first time, say 7 or 8 inches. Subsequent cultivation

is best accomplished by scarifiers or other tined implements, which should be used every time weeds appear. If a second ploughing is found necessary to cover weeds, it should be shallow, say 3 inches, as it is a mistake to turn up the cold soil from underneath just before seeding. The object of the cultivator should be to obtain a fine, firm, and clean seed bed in warm, moist condition. Much labour in hoeing and weeding will be saved later on if this is attended to.

Harvesting is done in March and April, when the pods dry off. The plants are pulled by hand, each man taking two rows at a time, and stooking the plants roots uppermost along the rows, and each stooking his plants on the same row. This is done to leave room for the drays to pass between the rows when carting in. The crop is usually left two to three days to dry; if the weather is moist, a longer time must be allowed. When dry enough, the crop is carted in and threshed.

In carting forks must not be used in lifting, the work being all done by hand, and the plants thrown on to the dray. Forks cause the beans to shell.

Threshing is done on cloths made of hessian, 25 yards long by 18 feet wide. Two of these cloths are set side by side, and pegged down. The dray drives up the centre, and the load is thrown off on both sides, making two rows for threshing. The dray should never go over the beans, a clear passage being kept for it in the centre.

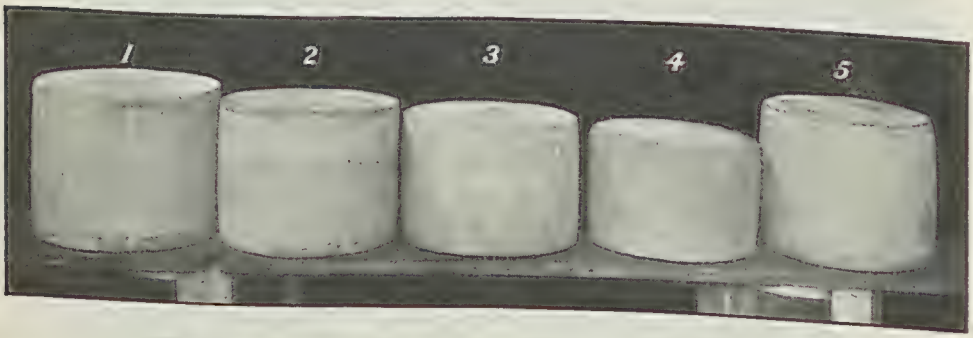
Threshing is done with a two-horse roller, which goes around and over the two rows of beans. During this process the beans are kept stirred up with poles, so that they do not set down too hard. Forks should not be used for this purpose, as they destroy the cloths. If the beans are tough, and do not thresh well, flails can be used to finish, but this is not always desirable, as flailing brings out the soft beans, which, later on, have to be picked out of the bulk. When all the beans are threshed out, the straw is shaken up, and tossed aside, leaving the threshed beans and chaff on the cloth. A new load is put on top of this, and the threshing process repeated. Towards the end of the day the threshed beans are bagged and winnowed. Some growers winnow right off the cloth, others prefer to leave the beans in the chaff for a time; the latter is a good plan if they are quite dry. If, however, the chaff is at all damp the seed is liable to mildew, and this condition must be avoided. After winnowing, the beans are hand-sorted, and all discoloured, flat, or other inferior ones are discarded. They are then bagged ready for market.

Orbost beans are sold largely for seed, and are an especially good sample, being of good size and colour. Special care must be observed to keep the beans reserved for seed stored in a dry place, as any mildew, to which they are readily liable, injures their germination and value.

SHOULD MILK FOR CHEESE MAKING BE PAID FOR ACCORDING TO ITS FAT CONTENT?

By R. T. Archer, Senior Dairy Inspector, and G. C. Sawers, Cheese Expert.

In order to demonstrate that milk for cheese-making should be paid for according to the quality indicated by the Babcock tester, certain experiments were recently made. In each of the five cases, of which particulars are given hereunder, 500 lbs. of milk was made into cheese. To obtain milk giving the wide variation in fat contents required for the test, that of different breeds of cattle was used, so that no addition or subtraction of fat would be necessary. No effort was made to ascertain which breed yielded the best milk for cheese-making, the object of the experiments being simply to show that milk ought to be paid for according to its quality. The following are the results obtained in the five tests carried out:—



—	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Weight of milk, lbs. ..	500	500	500	500	500
Percentage of fat ..	5·1%	4·3%	4·1%	3·45%	5·2%
Weight of cheese, lbs. ..	57	53¼	51¼	43	61
Value of cheese at 1s. per lb.	57/–	53/3	51/3	43/–	61/–
Value of milk per gallon ..	13½d.	12¾d.	12¼d.	10¼d.	14½d.
500 lbs. of milk at 1s. 6d. per lb., butter-fat	38/3	32/3	30/9	25/10½	39/–
Total solids	13·63%	13·52%	13·26%	11·62%	14·54%
Solids not fat	8·53	9·22	9·16	8·17	9·34
Ash	·68	·70	·72	·66	.74
Specific gravity	1·031	1·032	1.033	1·0303	1·033
Amount of fat in the milk..	25·5 lb.	21·5 lb.	20·5 lb.	17·25 lb.	26·0 lb.
Amount of fat in cheese ..	23·3 lb.	18·22 lb.	16·6 lb.	16·52 lb.	23·14 lb.
Amount of fat lost ..	2·2 lb.	3·28 lb.	3·9 lb.	0·73 lb.	2·86 lb.
Percentage of fat lost ..	8·62%	15·25%	19·0%	4·23%	11·0%
New cheese, per lb. of fat ..	2·44	2·79	2·73	2·73	2·42
Matured cheese, per lb. of fat	2·23	2·47	2·5	2·49	2·35
Pounds of milk to a pound of cheese	8·77	9·38	9·75	11·6	8·2
Pounds of cheese to a gallon of milk ..	1·14	1·065	1·025	.86	1·22

If a milk is rich in fat it is also rich in other solids, and it is the solids in the milk (not the water) that represents the food value. Those cows, however, which gave milk of comparatively low fat test usually give a greater quantity, in this way compensating for the small fat content.

It is only equitable then that the milk should be paid for according to its quality. While the butter-fat test does not determine its actual value, payment on that basis is very much fairer than payment by the gallon irrespective of its solid contents.

For cheese-making the fat and casein test gives the actual value. This test can be simply made; but, unfortunately, a section of the dairy farmers have not yet come to recognise that even the butter-fat test is a necessary step. For instance, the milk from which the cheese in No. 5 was made yielded 18s. worth more cheese than that of No. 4. This made the milk of No. 5 worth 4½d. per gallon more valuable than No. 4.

The butter-fat contained in the milk of No. 5 was 26 lbs., which, at 2s. 4d. per lb., would have given, approximately, 61s.—the value of the cheese made from it. No. 4 would have yielded 17¼ lbs. fat, and this at 2s. 4d. per lb. would have given 40s. 3d., while the cheese was worth 43s. On a butter-fat basis at 1s. 6d. per lb., the milk of No. 5 would have been worth 13s. 1½d. more than that of No. 4, not taking into consideration that it was richer, containing 1.17 per cent. more non-fatty solids and 2.92 per cent. more total solids.

For condensing it is understood that in milk-testing more than 3.3 per cent. fat is not required, and some condenseries will not pay any more for milk containing a higher percentage. If this be so, milk similar to that used in No. 5 might be reduced to that standard by separating sufficient to yield 9½ lbs. butter-fat, which, at 1s. 6d. per lb., would be worth 14s. 3d., and still be the better milk for condensing owing to its excess of solids, as the more solids there are in milk the more condensed milk will it yield. The largest milk condensing company in the world recognises this, and pays, approximately, on the following scale:—

For Milk Testing.

Per gallon of 10 lb.

3·3 per cent.	3·5 per cent.	4 per cent.	4·5 per cent.	5 per cent.
7d.	7·3d.	8d.	8·8d.	9·5d.

The same principle applies in the case of milk required for milk powder; and, in New Zealand, where this business is developing rapidly, there is a movement on foot to arrange for the purchase of milk on its total solid contents as estimated by the fat test and specific gravity according to Richmond's formula, thus recognising that the richer the milk the more valuable it is.

STANDARDIZED PACKING AND GRADING OF FRUIT.

By Ernest Meeking, Senior Fruit Inspector.

(Continued from Vol. XVI., Page 746.)

Fruit Act, 1917, Part II., and Regulations.

Though assented to on 22nd October, 1917, the Victorian Fruit Act did not come into operation until 17th May, 1918, the date on which the Regulations under the Act were proclaimed.

That portion dealing with the packing, grading, and marketing of fruit was framed on somewhat similar lines to the Fruit Marketing Act of Canada, yet it differs from the Canadian legislation in many respects, chiefly in the direction of providing that the sale of fruit in open cases (that is, cases with the lid or side removed), or on street barrows, or in retail shops, may be regulated by prescribing that such fruits shall be graded and marked accordingly.

So far, the Regulations have been made to apply only to fruits sold in cases, whether the cases are closed or the fruit is exposed for sale with the lid or side removed. The provisions in connexion with the closed cases are much more stringent than those which apply to fruit sold in open cases. Potatoes and onions are also included, and grade standards are established for these. This, however, does not concern the subject-matter of this article.

The following is a short digest of the Regulations, so far as these apply to the sale of fruit:—

DEFINITIONS.

In the definitions, "Advertising Matter" means any paper, card, slip, or anything inserted into any package of fruit or vegetables, and which bears any written or printed statement used for the purpose of advertising.

"Falsely packed" means packed in any other way than is prescribed.

"False Mark" means any marking or description which, by reason of anything contained therein or omitted therefrom is likely to mislead in a material respect as regards the grade, weight, or variety of any fruit or vegetables, or the description, kind, capacity, materials, dimensions, measurements or conditions of any package to which it is applied, and includes every alteration of any mark or description, whether by way of addition or effacement or otherwise, which makes the marking false or likely to mislead in a material respect.

"Foreign Substances" means any earthy matter, stones, sand, or gravel.

"Fruit" means any fruit declared by the Governor in Council by notice in the *Government Gazette* to be fruit for the purposes of these Regulations.

"Grade" shall have relation to colour, maturity, number, size, variety, and soundness, and graded and grading shall have a similar meaning.

"Marks," in relation to fruit or vegetables or packages, means any description, information, statement, words, or marks, or any suggestion direct or indirect—

(*a*) as to the colour, kind, number, size, soundness, variety or weight of fruit or vegetables, and the capacity, dimensions, or measurements of packages—

(*b*) as to the place or locality in or at which the fruit or vegetables were produced or packed or the packages were made—

(*c*) as to the name, address, and guarantee of the manufacturer of the package or the name and address of the purchaser of the fruit or vegetables or the person by whom they were selected, packed, or in any way prepared for market—

(*d*) and includes any mark which, according to the custom of the trade or of common repute is taken to be an indication of the above matters, and "marked" shall have a similar meaning.

"Packed" means packed as prescribed.

"Packing Material" means strawboard, wood-wool, wrapping paper, or other material used in packing fruit or vegetables.

"Prescribed" means prescribed by these Regulations.

"Registered Brand" means any brand which has been registered with the Department of Agriculture in pursuance of these Regulations.

"Sound" and "Soundness" means freedom from damage or decay and from any abnormal condition of or in fruit or vegetables, whether consisting of the presence of or caused by or due to the operations, development, growth, or decay of any insect or fungus.

"Size" in relation to fruit means the diameter or size of any fruit measured from side to side at right angles to the axis of the stem and the calyx or apex.

"Standards" means the standards set out in these Regulations—

"Vegetables" means any vegetables declared by the Governor in Council by notice in the *Government Gazette* to be vegetables for the purposes of these Regulations.

The following fruit and vegetables have been declared fruit and vegetables within the meaning of the Act:—

FRUIT.

Apples	Gooseberries	Pears
Apricots	Grapes	Persimmons
Bananas	Loganberries	Pineapples
Blackberries	Loquats	Plums
Cape Gooseberries	Mangoes	Quinces
Cherries	Nectarines	Raspberries
Citrus Fruits	Passion Fruit	Strawberries
Currants	Peaches	Tomatoes
Figs		

VEGETABLES.

Asparagus	Cauliflowers	Peas
Beans	Cucumbers	Potatoes
Beetroot	Lettuces	Tomatoes
Cabbages	Onions	Turnips
Carrots	Parsnips	

Packing, Grading, and Marking of Fruit and Vegetables.

The regulations regarding the packing, grading, and marketing of fruit and vegetables provide generally that the outer layers or shown surface of fruit or vegetables, whether packed in a case or sold loosely shall be so packed or arranged that they shall be a true indication of the average grade of the whole of the fruit or vegetables, the manner in which such fruit or vegetables are stacked, arranged, or packed, and the presence of any foreign substance. This Regulation, therefore, provides generally against the "topping" of any fruit or vegetables. In addition, apples, citrus fruits, peaches, and pears must be graded in four grades, viz., (*A*), (*B*), (*C*), or (*D*).

Grade *A* shall consist of well-grown specimens of one variety, sound, of uniform and of at least normal size, and of good colour for the variety, grade, or size, of normal shape, and properly packed.

Grade *B* shall consist of well-grown specimens of one variety, sound, of uniform and of not less than medium size, and of good colour for the variety, grade, and size of normal shape, and properly packed.

Grade *C* shall consist of specimens of uniform, and of not less than medium size for the variety and grade, sound, and properly packed.

Grade *D* shall consist of sound specimens, so packed that the outer layers or shown surface shall be a true indication of the average grade of the fruit throughout the package.

In addition to the above, additional requirements are provided for apples, so far as sizes and colour are concerned, as follows:—

Grade A.

All apples in this grade shall consist of specimens of not less than 2½ inches in diameter, excepting that normally small varieties, such as Fameuse (Pomme de Neige), Yates, Summer Pearmain, &c., shall consist of specimens of not less than 2¼ inches in diameter.

Wholly red varieties, such as Baldwin, Black Ben Davis, Hoover, Jonathan, King David, &c., shall, when such varieties are not less than 2¾ inches in diameter, consist of at least 75 per cent. of specimens of good red colour for the variety, and if less than 2¾ inches in diameter shall consist of at least 90 per cent. of specimens of good red colour for the variety.

Striped or partially red varieties, such as Cox's Orange Pippin, Delicious, Nickajack, Rome Beauty, &c., shall, when such varieties are not less than 2½ inches in diameter, consist of at least 50 per cent. of specimens of good red colour for the variety, and, if less than 2½ inches in diameter, shall consist of at least 75 per cent. of specimens of good red colour for the variety.

Yellow or green varieties, such as Cleopatra, Dumelow Seedling, London Pippin, or Newton Pippin, shall consist of specimens of characteristic colour for the variety.

Grade B.

All apples in this grade shall consist of specimens of not less than 2¾ inches in diameter. Wholly red or striped or partially red varieties shall consist of at least 33⅓ per cent. of specimens of good red colour for the variety. Yellow or green varieties shall consist of specimens of characteristic colour for the variety.

Grade C.

All apples in this grade shall consist of specimens of not less than $2\frac{1}{4}$ inches in diameter. No colour requirements are needed for this grade, excepting that specimens shall not be clearly immature.

Grade D.

Apples in this grade must consist of specimens not less than 2 inches in diameter, and packed in accordance with the general requirements of these Regulations, viz.:—That the outer layers or shown surfaces of the fruit contained in the package shall be so packed that they shall be a true indication of the average grade of the whole of the fruit contained in such package.

No colour requirements are needed in this grade, excepting that specimens shall not be clearly immature.

Notwithstanding anything to the contrary, normally small varieties, such as Fameuse (Pomme de Neige), Yates, Summer Pearmain, &c., shall be allowed in any grade if the specimens in such varieties are not less than the following diameters:—

1. Grade A.—$2\frac{1}{4}$ inches.
2. Grade B.—$2\frac{1}{8}$ inches.
3. Grade C.—$2\frac{1}{8}$ inches.
4. Grade D.—2 inches.

General Requirements of the Regulations.

These provide that—

(*a*) packages must be of the sizes shown in the Regulations—

(*b*) the proportion of foreign substances shall not exceed $2\frac{1}{2}$ per cent., either by weight or measurement, of the total contents of a case, or $3\frac{1}{3}$ per cent. of the total contents of any package—

(*c*) Packing materials shall not exceed the quantities sufficient to cover the top and bottom of the package of a combined thickness of $1\frac{1}{2}$ inches, excepting in the case of grapes, when cork-dust may be used to the extent of 5 lbs. for each package—

(*d*) no more than two wrappers shall be used to wrap each fruit—

(*e*) advertising matter must be confined to one slip, label, or sheet of paper of a thickness not exceeding one-sixteenth of an inch, and of no greater size than is sufficient to cover the top of the fruit in any case or package—

(*f*) in the case of any fruit excepting apples, citrus fruits, peaches, or pears, which are provided for by grading, the net weight or number or quantity of the contents shall be marked on the outside of the package itself or on a docket, tag, or label in a conspicuous position on the outside of the package in letters of not less than $\frac{1}{4}$ inch in length—

(*g*) the name of the packer or grower must also be marked on the outside of the package in letters of not less than $\frac{1}{2}$ inch in length. In the case of a firm, the name of the firm must be so shown—

(*h*) the name of the variety or varieties of the fruit must be shown on the package in letters not less than $\frac{1}{4}$ inch in length. In the case of apples, citrus fruits, peaches, or pears, the package must be marked with the grade letters A, B, C, D of not less than $\frac{1}{4}$ inch in length—

(*i*) the maker's guarantee must also be shown on packages within a space measuring not more than 3 inches long and 1½ inches wide, with the words, "Guaranteed by maker to contain one Imperial bushel," or "Guaranteed by maker to contain one-half Imperial bushel," or "Guaranteed by maker to contain one-quarter Imperial bushel," or, in the case of grapes, with the words, "Guaranteed by maker to contain 25 lbs. net," or "Guaranteed by maker to contain 28 lbs. net," as the size of the package warrants. Punnets and buckets for berry fruits must be marked with the words, "Guaranteed by maker to contain 1½ pints," or "Guaranteed by maker to contain two Imperial gallons"—

(*j*) all fruit packed for sale must be sound.

Exemptions.

Fruit or vegetables sold for manufacturing purposes shall be exempt if the packages are marked legibly with the words, "For factory use," and if the seller can satisfy an inspector that such fruit is for manufacturing purposes only.

Fruit sold in open packages, *i.e.*, with the lid or side removed need only be marked with the name or registered brand of the owner, and the maker's name and guarantee, and in the case of apples, apricots, citrus fruits, peaches, and pears the designation of the grade A, B, C, or D.

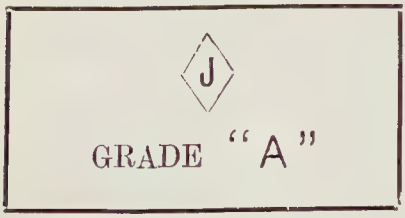
EXPLANATORY NOTES.

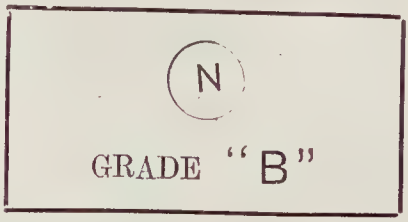
1. A mark made by a lead pencil will not be considered durable, but a clearly printed label firmly affixed to a package will be considered as such.

2. When the name of the variety is unknown or doubtful, the symbol "X" may be substituted for the variety name.

3. Slackly packed and over-pressed packages are to be considered improperly packed if the condition is likely to result in permanent damage to the fruit during transit or handling.

4. Concerning the marking of packages with the lid or the side removed, as required by Regulation IV. (3), the following styles of label, measuring 1 inch by 2 inches, and bearing the imprint of the owner's registered mark or brand and the designation of grade are suggested as an example.





Since the introduction of the Victorian regulations, Tasmania has adopted grading regulations with respect to apples and pears.

A digest of these will be given in next article, and also an outline of the standards adopted in some of the United States and the Dominion of Canada.

FARM NOTES FOR FEBRUARY.

STATE RESEARCH FARM, WERRIBEE.

H. C. Wilson, Manager.

Weather.

During the month the weather has been seasonable, 30 points of rain only having been recorded, making a total of 155 points for the year.

All natural pastures and stubble paddocks on the farm are particularly dry, and stock at present are depending to a large extent on the fodders grown under irrigated conditions, together with the dry feed of these stubble fields.

Good soaking rain in the district would materially benefit the stock outlook and replenish the water supply of the district, but such a fall would be more seasonable towards the end of the coming month.

Spring-Sown Rape as a Catch Crop.

Sixty acres of rape was sown in late September, 1919, on a fallow, which it is intended to crop this season with hay. Four pounds of Dwarf Essex Rape, with 56 lbs. superphosphate, was sown to the acre. The rain, which fell during November, gave the crop a good start, and during late December, January and February good sheep feed was secured from it. The total carrying capacity of the crop amounted to 600 sheep for five weeks, or, in other words, each acre carried the equivalent of one sheep for 50 weeks. Furthermore, being available in the dry months of the year, the fodder was not only fattening, but healthful. The sheep grazed on it gained considerably in condition, and an estimate of its grazing value has been put down at £1 per acre, with an initial outlay of 6s. 6d. for seed, manure and drilling. Past experience here has proved that a rape crop of this kind has rather a beneficial effect upon the soil, and the following main crop gives better results than if grown in the ordinary manner on bare fallow.

Preparation for Seeding, 1920.

On the dry farming lands of the farm, 650 acres were fallowed during the months from July to September of last year. These fallows have since been rolled, harrowed, and disc cultivated, and are now in good tilth awaiting further autumn rains, when they will be given the final cultivation before seeding.

During the month the following areas have been ploughed in preparation for various crops this winter:—60 acres for rape, 140 acres for barley, 200 part ploughed for oats.

The above areas, which have been green ploughed to carry winter crops of rape, barley and oats this season, were all fallowed in 1917, and carried crops of hay and wheat in 1919. The total cereal seeding this season will be (exclusive of experimental areas) 1,050 acres

Seasonable Activities During the Month of February.

Lucerne hay harvesting has received marked attention, some 150 tons of prime hay being stacked. The best fields have yielded up to

37 cwt. per acre in the single cutting, and the average for the season of 5 cwts. on such fields as these will amount of 7 tons. Generally throughout the district 5 to 5½ tons of good quality lucerne hay per acre may be estimated as an average yield. Irrigation activities have been carried on throughout the month, and, owing to the dry weather and the hot winds, which have prevailed, heavy waterings have been applied to the lucerne areas. To date for the season since 1st September, 1919, approximately 20 inches of water has been applied to all our irrigated areas, and it is estimated that one further watering of 4 inches per acre will complete the season. This will give a total of two acre-feet of irrigation water to every acre under the irrigation system of the farm.

Further activities, such as thrashing, straw baling, grain carting, chaff cutting, grading of seed wheat and despatch, destruction of noxious weeds, attention to dairy herd, sheep, cattle, horses and poultry, were carried out, as well as experimental work and general farming routine.

Fodder Reserves.—There has not been a more pressing problem facing the agriculturist and stock-owner for the past twelve months than the question of adequate fodder reserves. Conditions similar to those which prevail at present should teach those men dependent on the land for their living the great necessity to be ready for the dry times, which come periodically. No stock-owner should be without hay, or fodder of some kind, to carry his stock through a period of at least twelve months similar to that which we are at present undergoing. It is always false economy to sell this necessary reserve of fodder, even though the market price be tempting in the extreme. The holding of such reserves is the only real insurance against drought in the dry areas throughout the State.

At the present time, on this farm, 500 tons of wheaten and oaten hay, 225 tons of lucerne, 30 tons of baled oaten straw, and 160 tons of lucerne and oaten ensilage are on hand and are sufficient to carry the stock for at least 18 months from date in case of necessity.

Live Stock.

Horses.—Forty working horses are being continually employed at the seasonable cultural operations of the month, while 20 draught mares, with their foals by the Clydesdale stallion, Baron Wigton, are being grazed, and will be brought into work during April, when the heavy part of the seeding has commenced. The rations of the horses in full work at present is approximately 35 lbs. of oaten, lucerne, and wheaten hay chaff during working days—Monday to Saturday; while on Saturday afternoon and Sunday they are given lucerne hay in the shelter paddock, as well as chaff at night. No grain of any kind is now being fed, and it is maintained that the addition of lucerne to the ration of hay chaff makes up the necessary nutritive ratio so essential for the health and strength of these working horses.

Cattle.—Forty-four Red Poll cows are now being milked in the dairy, and six Friesians. These 50 cows are averaging approximately 150 gallons of milk per day. Their rations consist of 14 lbs. lucerne and oaten silage, together with 8 lbs. of bran per day in the bails, 12 lbs. lucerne hay in the feeding racks at night, and one hour per day grazing on irrigated lucerne. The health of the whole dairy herd

has been excellent during the month, and the cows are in good milking condition. There are on hand also 18 young and four aged bulls, together with 12 heifers and 10 dry cows

Sheep.—The total number of sheep being carried at present on the farm consists of the following:—640 Merino-Lincoln cross four-year-old ewes in lamb to Suffolk and Border Leicester rams, to drop from 1st April onwards; 30 Suffolk cross weaners; 30 mixed sheep as rations; 260 Border Leicester studs; 80 Suffolk studs; total, 1,040. The best of the stud sheep are now being given special treatment, with a view to exhibition in the forthcoming July Sheep-breeders' Show. The bulk stud and crossbreds are acting as scavengers in the fallows, pasture areas, stubbles, and occasional green fodders. Their condition is being maintained for lambing. Although the Suffolk and Border Leicesters studs were mated in the early part of January of this year, we do not expect the lambs from these flocks to drop to due date, as it has always been difficult to have these English breeds served before the middle or the end of February each year.

Main Work Proposed for the Month of March.

1. Continuation of lucerne hay harvesting and irrigation.
2. Final cultivation of fallows and preparation for seeding.
3. Completion of ploughing for winter crops of barley and oats.
4. Seeding of rape—catch crop, 60 acres.
5. Start to be made at early seeding of barley as fodder.
6. Maintenance of farming routine and improvement work.
7. Attention to live stock and dairy herds.
8. Excavation of main drainage channel through low levels of farm.

EXPERIMENTAL WORK.

By G. S. Gordon, Field Officer, Werribee.

General.

The chief work on the experimental fields has been that of ploughing and fallow cultivation in preparation of the seed-bed for this year's crops. Other items were:—

1. Examining and arranging the seed from apparently successful crosses for sowing as first generation crosses in 1920.
2. Final laboratory examination of the F1 and F2 crossbred cereals and individually recording, thrashing and preparing the seed from the selected plants.
3. Thrashing, winnowing and weighing the grain from F3 and F4 crossbred cereal plots, tabulating the results and grading the seed of those selected for further trial in long rows.
4. Harvesting sugar-beet seed from selected roots having a high sugar content.
5. Investigation of soil and subsoil conditions affecting the growth of lucerne under irrigation.
6. Despatch of graded seed wheat to farmers.

Seeding Tests, 1919.

The importance of graded seed, early sowing and suitable variety as factors governing successful cereal culture is again emphasized in

the following tables giving the results of seeding tests carried out at Werribee during the past season:—

TABLE No. I.

Graded Seed Tests, 1919.

Seed (65 lbs. per acre) Sown with 120 lbs. super. per acre on well-worked fallow, 29th May, 1919. Harvested 31st December, 1919. Variety, Graham.

Grade of Seed.	Yield per acre.	Remarks.
	bush. lbs.	
Normal seed (from harvester)	11 36	Average of 3 plots
First Grade	14 28	Average of 2 plots
Second Grade	12 44	„ „
Third Grade	11 4	„ „

Note.—The first grade of seed was retained by a screen having 2.75 m.m. openings. The second grade of seed was retained by a screen having 2.5 m.m. openings. The third grade of seed was that which passed through a screen having 2.5 m.m. openings.

TABLE No. II.

Early and Late Sown Variety Tests, 1919.

Seed 65 lbs. per acre, fertilized with 120 lbs. super. per acre. Sown on well-worked fallow in Field No. 3 N.E.

Variety.	Yield per acre.	
	Early Sown (28th May, 1919).	Late Sown (9th July, 1919).
	bush. lbs.	bush. lbs.
Yandilla King	10 8	1 28
Marshall's No. 3	10 8	2 32
Federation	12 48	2 24
Dart's Imperial	15 12	3 40
Gluyas	13 4	3 28
King's Early	13 52	2 0

TABLE No. III.

Early and Late Rate of Seeding Test with Algerian Oats.

Sown on fallow in field No. 4 N.E. Fertilized with 120 lbs. super. per acre.

Seed per acre.	Yield per acre.	
	Early Sown (28th May 1919).	Late Sown (4th July, 1919).
	bush. lbs.	bush. lbs.
Algerian Oats, 80 lbs.	19 32	3 0
„ „ 60 „	17 24	3 0
„ „ 40 „	14 24	2 24

Permanent Rotation Field.

The results from the various wheat plots in this field are recorded in order of yield in Table No. IV. The three plots sown on bare fallow are all at the top of the list, and give an average yield of 21 bushels 3 lbs. per acre. The next group of five plots—four following peas harvested for grain and one following rape—give an average yield of 17 bushels 55 lbs., while the plot on which wheat is grown every year is at the bottom of the list with only 15 bushels 11 lbs. per acre.

TABLE No. IV.

Permanent Rotation Field, 1919.

Yields from Wheat Plots.

Variety, Yandilla King. Seed per acre, 73 lbs. Sown 2nd June, 1919. Fertilizer—Super., 120 lbs. per acre. Plot area, 42 acres. Harvested 2nd January, 1920. Rainfall during growing period, 6 in.

Plot No.	Rotation.	Yield per acre.	Remarks.
		bush. lbs.	
15	Oats, Pastures, Fallows, Wheat	21 59	
25	Bare Fallow, Wheat ..	20 38	
20	Pasture, Fallow, Wheat ..	20 33	
32	Oaten Hay, Peas, Wheat ..	19 7	
35	Oaten Hay, Rape, Wheat ..	18 58	Outside plot, damaged by birds. Yield, including estimated loss
29	Barley, Peas, Wheat ..	18 20	
23	Rape, Peas, Wheat ..	17 41	
11	Rape, Barley, Peas, Wheat ..	15 33	
26	Wheat continuously ..	15 11	Plot containing a lot of wild oats

RUTHERGLEN EXPERIMENT FARM.

P. B. O'Keefe, Manager.

The rainfall for the month was nil, and heavy winds and dust storms were of frequent occurrence. Notwithstanding the dry conditions prevailing ploughing was carried on, and all areas, except those intended for late sowing with brown oats, barley, and peas, are nearing completion.

The distribution of seed grain has commenced, both wheat and oats being eagerly sought after. In the case of wheat the orders were so numerous that it was found necessary to limit parcels so as to insure all farmers securing at least a proportion of the amount required, thus at least putting them in the way of having a supply of pure seed for their own use next season.

Cultural Operations.

The total area now ploughed exclusive of Experiment Field is 500 acres, 200 acres of this being fallow which has been doubly cultivated with spring tooth cultivator; the remaining 300 acres is now being

rolled and worked up in preparation for seeding early in April. A further area of 80 acres will be ploughed later and seeded with brown oats 40 acres, barley 20 acres, and peas 20 acres.

Live Stock.

Live stock are holding their condition well, but food supplies are now becoming scarce, stubble growth and summer grasses having quite dried up.

Two cows both by Ayrshire bull have come in, one a heifer, the other on her second calf. The former shows a test of 4.4, the other 4.6. The best yield for the month was a shorthorn cross cow which calved during January; she yielded 850 lbs. milk with a 4.3 test. Produce to the value of £1 8s. per cow was sold. Fodder consists of soaked wheaten chaff and bran, sorghum, silage, and paddock pasture. Young stock are given a small daily ration, chiefly waste from cow feed, to help to maintain their condition.

Swine.

Pigs are rapidly increasing in weight, and show a much quicker development on new season's wheat. Hereunder is a table showing weekly increase in live weight of young pigs, weighed during the month, along with the weight of pollard and skim milk used, and price of same. The pigs were, as shown, six weeks old at first weighing, and were weaned a week previously. The crossbred pigs are from a large Yorkshire-Berkshire sow by a pure Berkshire boar. The pure breds are inbred, the sow having been served by her full brother. It was noticeable in the weighing for the week ended 18th February, 1920, that both lots of pigs had not gained as much in weight as during the previous week, no reason for which can be assigned, whilst the gain at subsequent weighing was made at a considerably increased cost for feed.

Table Showing Weekly Increase in Live Weight of Pigs, and Pollard, etc., Used, with Price, during February, 1920.

—	Age.	Date of Weighing	Total Weight in lbs.	Increase in 7 days in lbs.	Pollard used in lbs. at 1d. per lb.	Skim Milk used at 1d. per gallon.	Cost of Pollard.	Cost of Skim Milk.	Total Cost.
							s. *d.*	*s.* *d.*	£ *s.* *d.*
Cross-bred 11 pigs.	6 wks.	4.2.20	278	..	..	..	..	..	..
	7 „	11.2.20	339	61	61½	20 gals.	5 1½	1 8	0 6 9½
	8 „	18.2.20	395	56	57½	15 „	4 9½	1 3	0 6 0½
	9 „	25.2.20	455	60	88	17 „	8 2	1 5	0 9 7
		Total gain ..		177 lbs.			Cost of Feed ..		1 2 5
Pure Bred 6 pigs	6 wks.	4.2.20	143	..	..	..	..	..	..
	7 „	11.2.20	173	30	30½	12 gals.	2 6½	1 0	0 3 6½
	8 „	18.2.20	197	24	31	9 „	2 7	0 9	0 3 4
	9 „	25.2.20	232	35	63	11 „	5 3	0 11	0 6 2
		Total gain ..		89 lbs.			Cost of Feed ..		0 13 0½

RAINFALL IN VICTORIA.

Fourth Quarter, 1919.

District.	—	October.	November.	December.	Year.
		Points.	Points.	Points.	Points.
Mallee North ..	Mean	27	55	187	1,007
	Normal	116	95	81	1,317
	Per cent. Departure ...	−77	−42	+131	−24
Mallee South ...	Mean	45	44	150	1,191
	Normal	121	102	95	1,393
	Per cent. Departure ...	−63	−57	+58	−14
North Wimmera ...	Mean	81	18	180	1,324
	Normal	147	112	101	1,639
	Per cent. Departure ...	−45	−84	+78	−19
South Wimmera ..	Mean	112	24	111	1,542
	Normal	191	135	118	2,003
	Per cent. Departure ...	−41	−82	−6	−23
Lower Northern Country	Mean	50	81	206	1,483
	Normal	144	120	107	1,701
	Per cent. Departure ...	−65	−32	+92	−13
Upper Northern Country	Mean	63	85	241	1,522
	Normal	187	141	130	2,004
	Per cent. Departure ...	−68	−40	+85	−24
Lower North-East ...	Mean	121	112	558	2,339
	Normal	270	207	193	2,875
	Per cent. Departure ...	−55	−46	+189	−19
Upper North-East ...	Mean	168	155	660	3,498
	Normal	396	306	276	4,323
	Per cent. Departure ...	−58	−49	+139	−19
East Gippsland ...	Mean	177	176	568	3,744
	Normal	292	229	261	2,993
	Per cent. Departure ...	−39	−23	+116	+25
West Gippsland ...	Mean	198	162	462	3,725
	Normal	337	268	277	3,452
	Per cent. Departure ...	−41	−40	+67	+8
East Central ...	Mean	192	120	374	3,052
	Normal	326	274	280	3,387
	Per cent. Departure ...	−41	−56	+34	−10
West Central ...	Mean	133	81	280	2,349
	Normal	220	184	173	2,360
	Per cent. Departure ...	−40	−56	+62	—
North Central ...	Mean	115	80	278	2,239
	Normal	240	201	183	2,644
	Per cent. Departure ..	−52	−60	+52	−15
Volcanic Plains ...	Mean	123	61	177	2,072
	Normal	223	185	162	2,401
	Per cent. Departure ...	−45	−67	+9	−14

RAINFALL IN VICTORIA—*continued.*

District.	—	October.	November.	December.	Year.
		Points.	Points.	Points.	Points.
West Coast ..	Mean	179	52	135	2,743
	Normal	271	207	180	2,995
	Per cent. Departure ...	−34	−75	−25	− 8

N.B.—100 points = 1 inch.

REMINDERS FOR APRIL.

CATTLE.—As the nights become colder the dairy cows should be rugged. The rugs should be removed in day-time when the shade temperature reaches 60 degrees. If new grass is plentiful, give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. It will be found profitable to give a few pounds of bran, crushed oats or pollymeal in addition to other feed, to all cows giving a fair quantity of milk. Read article by Mr. B. A. Barr, "Food Values and Rations," in *Journal* for September, 1916. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Only exceptional cows or those required for city milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter, give the best returns for the season, and be dry when the feed is dry and at its worst. Calves should have lucerne hay or crushed oats when grass is not plentiful. Take care that salt lick previously recommended is available. One or two pounds of linseed cake or meal given daily should be found beneficial. In addition to its feed value, the oil in the cake or meal will counteract the effect of dry feed, which is liable to cause impaction.

SHEEP.—Merino and fine cross ewes, if mated early, will lamb from now on. Those in lamb to the larger British breeds of rams can be expected to give a certain amount of trouble in lambing.

Close attention should be given morning and evening to save every lamb possible, and pick up any ewes that may be cast. If the ewes are well-woolled sorts, they will need crutching, at the same time clear wool from around teats, and from the eyes. If the ewes are attentive mothers, any lambs that are found dead after these precautions, apart from weather conditions, foxes, &c., are just as well gone. Give purgative drenches at first sight of ewes appearing ill in any way. Give warm salad oil to any lambs that are dull in appearance. Ewes after difficult parturition or retention of after-birth can often be saved by flushing out with ½ oz. Lysol to 3 pints warm water. Reserve fresh pasture, or better still, sow a mixed green crop to turn ewes into later on, but not while carrying the lambs, this is too often injurious. On fine mornings when attending ewes, if feed is plentiful and ewes strong castrate as many ram lambs as possible, they are easily caught when two or three days old. Place them between the feet on the ground, no holder is necessary. In districts where conditions make second dipping a necessity, see that it is done before the weather becomes too unsettled.

PIGS.—Sows not already served should be put to the boar. Supply all pigs with plenty of bedding, and see that sties are warm and well ventilated. Supply sows liberally with grain. Castrate young boars as early as possible. Pigs should be highly profitable now, as pork is very dear. Rape, barley (especially skinless), oats, &c., may be sown for grazing during winter.

POULTRY.—Do not feed maize this month—soft food aids moult; add a teaspoonful of linseed to each bird's ration once daily. The more exercise the hens get the better they moult. Add to drinking water one packet of Epsom salts to twenty birds. Keep a sharp look out for chicken pox. Forward pullets should now be in their winter quarters, with plenty of scratching litter, and fed liberally—including ration of animal food. Grit, shell, and charcoal should always be available.

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